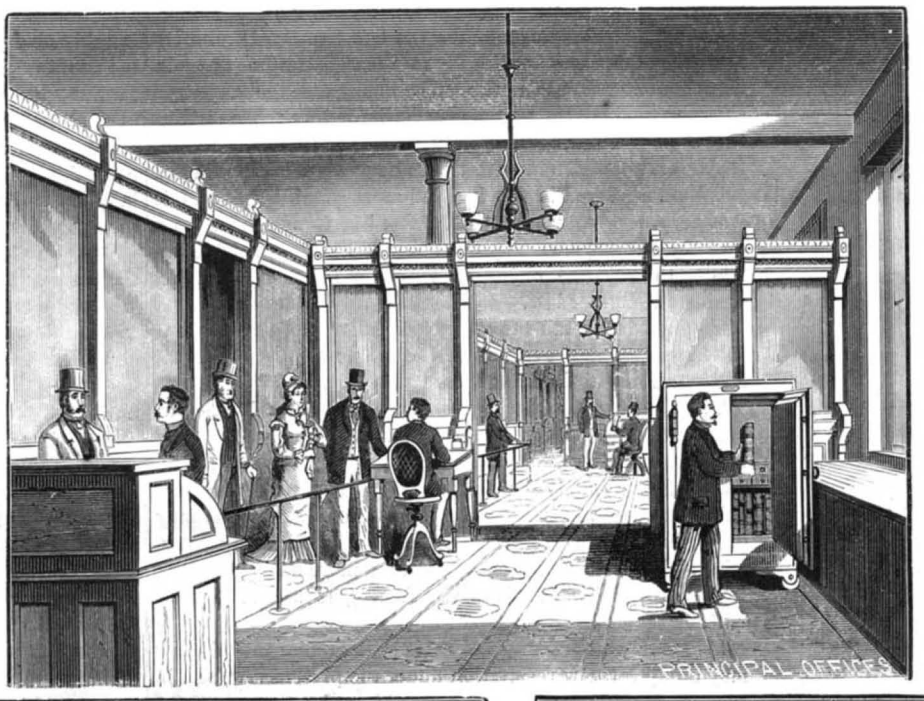
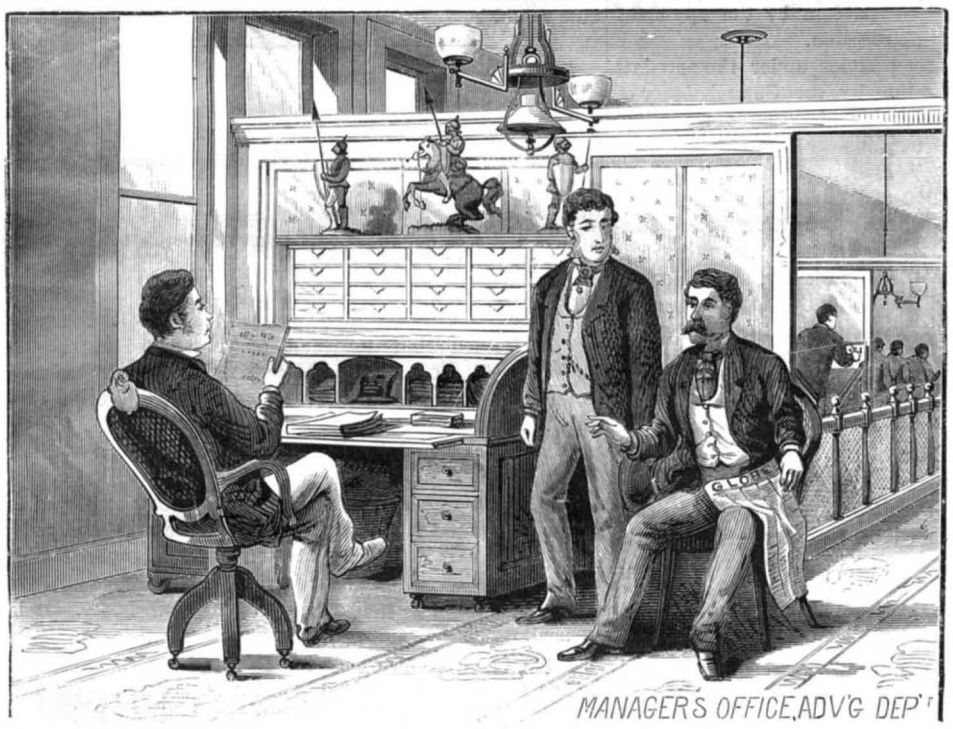
SCIENTIFIC AMERICAN

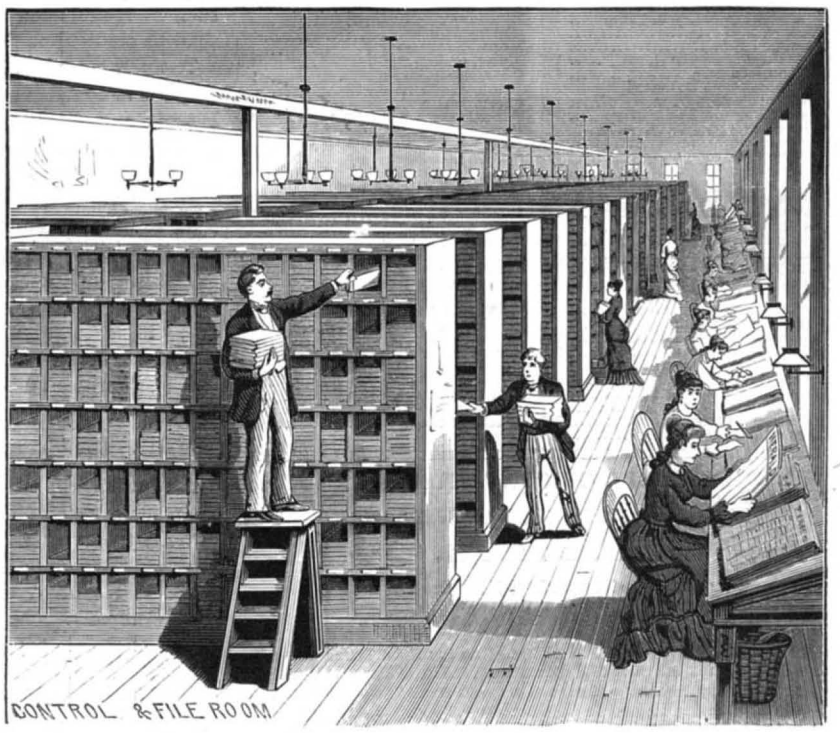
[Entered at the Post Office of New York. N. Y., as Second Class Matter.]

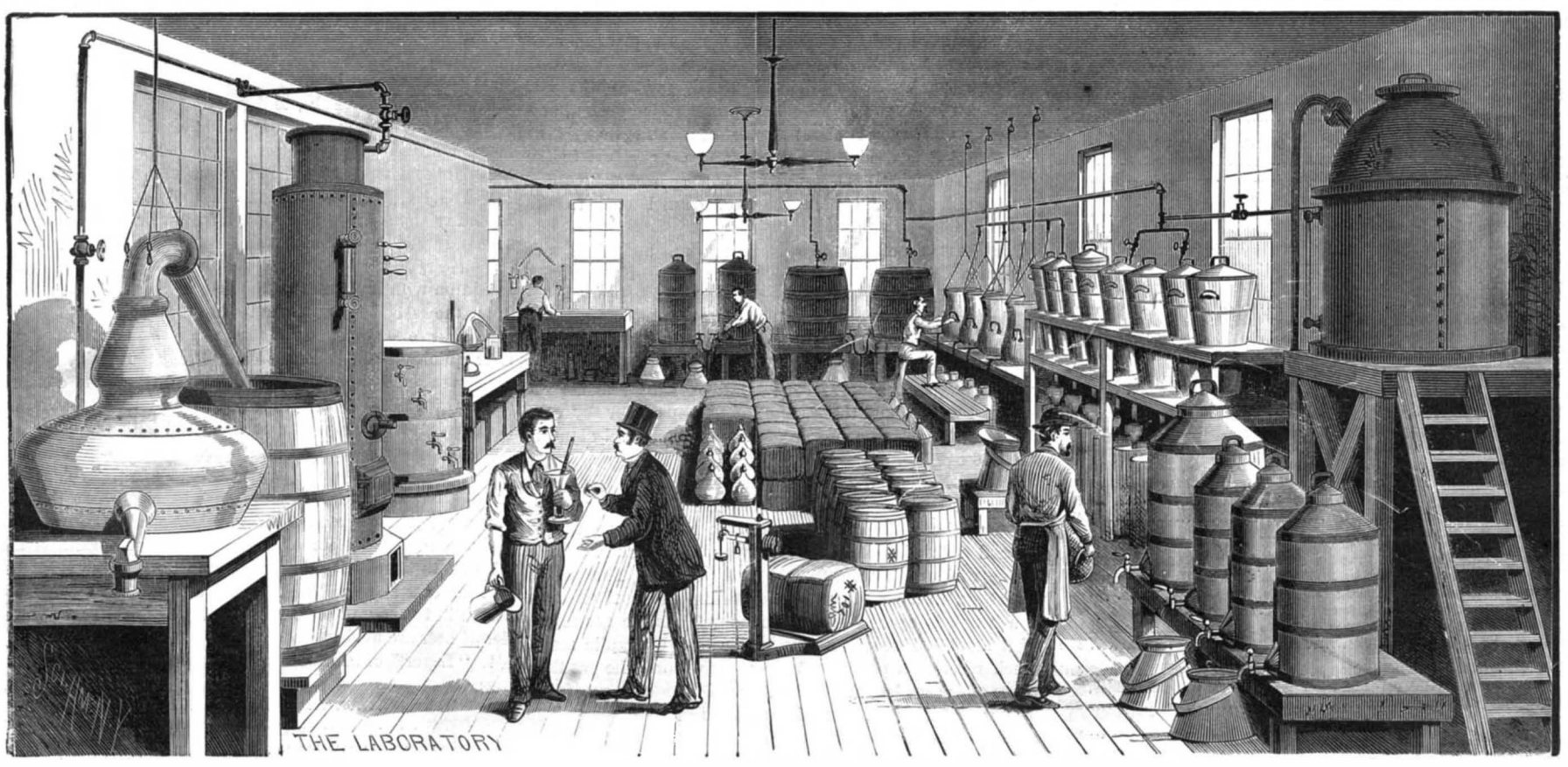
A WEEKLY JOURNAL OF PRACTICAL INFORMATION. ART. SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLIV.—No. 13. [NEW SERIES.] NEW YORK, MARCH 26, 1881. [$3.20 per Annum. [POSTAGE PREPAID.









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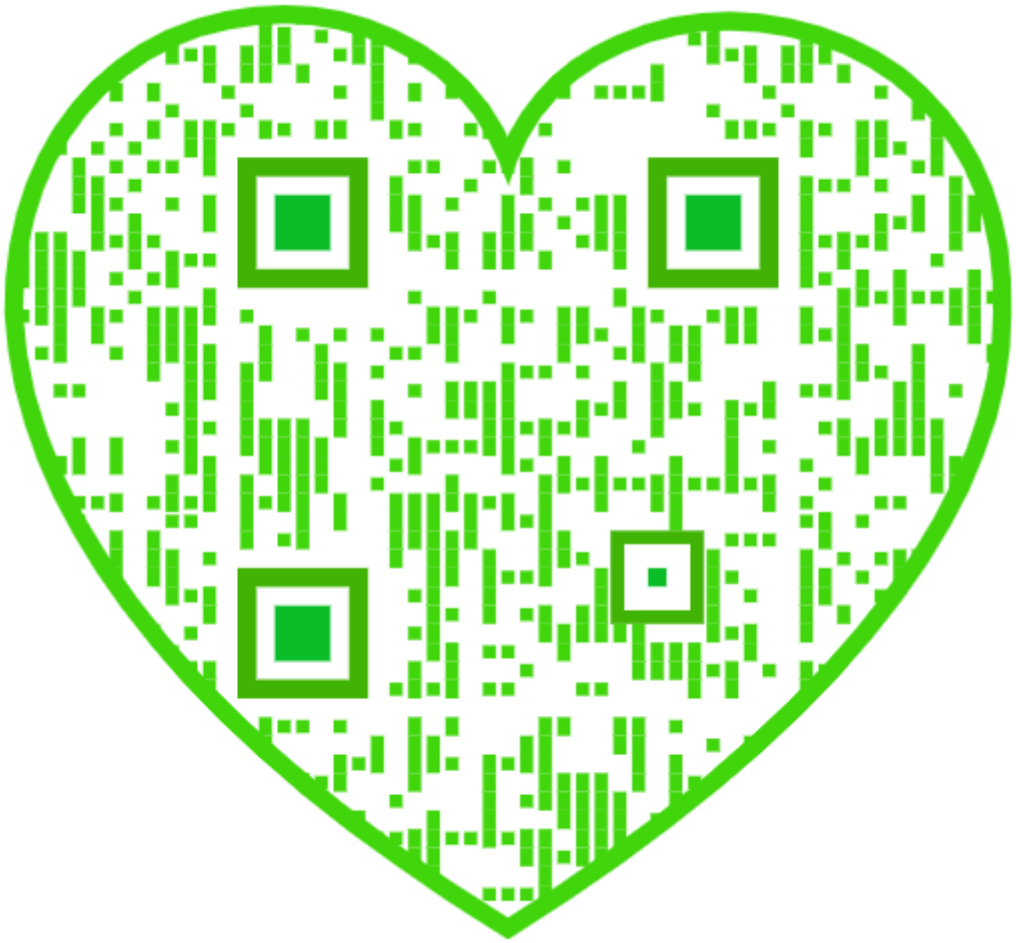

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, MARCH 26, 1881.

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A NEW TRADE MARK LAW.

By act of Congress, July 8, 1870, provision was made for the registration at the Patent Office of all descriptions of trade marks; and by subsequent legislation some very peculiar, we might almost say savage, additions were made for the pursuit and punishment of trade mark infringers. Except as to these last features, the law for trade mark registration proved to be very popular; hundreds of applications were made, and the official rules and machinery for issuing trade mark certificates had become well established, when, on November 18, 1879, the Supreme Court of the United States, in the case of the U. S. *vs.* Steffens, and the same *vs.* Wittemann, to the public surprise, decided that the whole legislation respecting trade marks must fall, as being void for want of constitutional authority. The court held that a trade mark is neither an invention nor discovery nor the writing of an author within the meaning of the constitution; that no law made under the constitutional authority to issue patents was applicable to the registration of trade marks; that "if trade marks can be in any case the subject of congressional action, that action is limited by the constitution to their use in commerce with foreign nations, among the several States, and with the Indian tribes." Nothing of this kind appeared in the legislation as established, and it was accordingly declared void. The last Congress passed a new trade mark law—approved March 3, 1881—which is intended to avoid the objections raised by the Supreme Court against the former law.

The new law retains the principal features of the old but the inquisitorial provisions of the old law for the pursuit and punishment of infringers are struck out.

The new law provides that owners of trade marks used in commerce with foreign nations or with the Indian tribes may obtain registration, at the Patent Office, by paying an official fee of twenty-five dollars, and complying with such rules and regulations as the Commissioner of Patents may prescribe. The duration of the registration is thirty years, with right to renewal for thirty years more on payment of twenty-five dollars additional. Infringers are to be dealt with by the courts.

Persons who have obtained registration under the old law may apply for new regstration under the present law, and in such cases the money formerly paid in by the applicant shall be credited on the new application.

The new rules and forms for practice under the new law are now in course of preparation by the Commissioner of Patents, and will be duly promulgated. In the meantime all who desire to obtain registration, or who wish to have their old trade marks re-registered, are advised to consult with the proprietors of this journal, Messrs. Munn & Co., 37 Park Row, New York, who will promptly attend to all business thereto pertaining.

The full text of the new trade mark law, and also the new census of the United States (1880) by States and counties, will be found in the new edition of the SCIENTIFIC AMERICAN REFERENCE BOOK, now going through the press. Price 25 cents. To be had at this office and of all newsdealers.

THE ACTUAL COST OF MAKING ILLUMINATING GAS.

An investigation is going on in Philadelphia touching the management of the city gas trust, the gas works being owned by the city and operated by official trustees. A recent witness before the investigating committee was Mr. E. S. T. Kennedy, expert of the New York Mutual Gaslight Company. Mr. Kennedy said that this company manufactured last year 721,000,000 cubic feet of gas, 30 per cent of which was from wood, 30 per cent from Youghiogheny coal, and 40 per cent from naphtha. During the year the amount of gas got from a ton of coal (2,240 lb.) was 15,000 cubic feet.

The gas averaged 27 candle power, and the price charged was $2.25 per 1,000 cubic feet.

The present process with coal, wood, and naphtha was introduced in August, 1878. It deposits no lampblack, and no heavy oil beyond about 1 per cent, and that is so heavy that it is used to great advantage as a fuel in the works. To enrich coal gas, Mr. Kennedy said the method was to add a certain percentage of cannel coal to the common coal.

The gas is entirely free from smoke, and does not blacken a ceiling unless within three feet of the flame, when it scorches. With 120 miles of pipe the loss by leakage is about 8 per cent; it is called "unaccounted-for gas," and the amount of it is determined by deducting from the amount registered in the station meter at the works, the gas consumed in the public lamps, in the offices and works, and the amount of gas paid for by consumers. The average power of the gas from coal alone is about 16 candles.

In the Mutual Works there are three separate departments: for coal, wood, and naphtha. In the coal gas department the coal is brought into the retort room, and is charged into the clay retorts every four hours. That charge will weigh from 215 to 230 pounds. The retorts are set six to a bench, and in drawing the coal one-half of a bench is opened every two hours. As the gas comes off it ascends through a stand pipe to a hydraulic main, which receives a portion of the tarry vapors; the gas then passes off, is cooled, and goes through a double purifying process. It is then measured and stored in the holders. The labor is subdivided, so that there is an average of ninety-one one hundredths of a man to a bench. The average production of coke on a ton of coal is 70 per cent of the original weight of the coal, or a long ton of 2,240 pounds ought to produce 1,500 pounds of coke, or thirty-five bushels. That is the average and ordinary amount produced to-day by the Mutual Gaslight Company.

The average production of gas tar and ammoniacal liquor is 12 or 14 gallons per long ton. The product of ammoniacal liquor varies, some companies producing as low as 15 gallons and others as high as 40; the average would be about 30. The present price of coke is between 8 and 9 cents a bushel; from 2 to 2½ cents a gallon for tar, and about 1 cent a gallon for ammoniacal liquor.

A double system of purification is employed by the Mutual Company. First, with an iron mixture, and afterward with oyster-shell lime. There are two principal impurities to handle—sulphureted hydrogen and carbonic acid. The lime is used to remove the latter. After it becomes thoroughly charged it is treated to a process of Dr. Wilkinson, the result of which is a lime that does one third more work than any lime that can be bought, and at one-half the cost of the new lime. The same quantity of lime has been used one hundred and fifty times, and the chemist of the company thinks it will go on forever. There is no depreciation in quantity or quality. They have been using this process for two years without any increase of the lime.

On the following day, after Mr. Kennedy had inspected the plant and processes employed at the Philadelphia gasworks, he took the stand again. In reply to the question: "What does it cost to manufacture gas?" Mr. Kennedy said: "The average cost of gas per 1,000 cubic feet in the gasholder is 65 cents; that does not include the cost of distribution. That I consider a fair average price based upon present prices of material and labor. I say 65 cents; it may be a cent or two more or less. I will undertake the management of your gasworks and produce coal gas at the present prices of coal for 65 cents in the holder. My calculation is based upon 16-candle gas."

In reply to the question, "What does it cost your company to put gas in the holders under your processes?" Mr. Kennedy replied: "Less than 50 cents a thousand." The Mutual Company expect eventually, he said further on, to manufacture from wood and naphtha exclusively, when the cost would be from 35 to 40 cents.

LAGER BEER.

Lager beer, the beer of Bavaria (and the United States), is prepared by a slow process of fermentation from strong infusions of malt, barley, and hops and grape sugar or glucose. The beer is usually fermented in winter, as it requires a temperature of not more than from 40° to 50° Fah.; and in hot weather the rooms must be cooled by means of ice or ice machines.

This kind of fermentation is what is called sedimentary or under fermentation, in contradistinction to ordinary or surface fermentation—the scum or yeast collecting at the bottom instead of at the surface, so that the air has free access and the gluten is more completely converted into yeast. This *bottom yeast* is quite different from ordinary yeast, and has a tendency to induce the kind of fermentation by which it was produced.

The following is a brief outline of the process employed at one of the largest lager beer breweries in New York city:

The barley is placed in wooden cisterns, covered with water, and allowed to remain for two or three days in soak, the water being changed once in twenty-four hours. It is then allowed to drain, and is subsequently thrown out in heaps on stone floors, where it heats spontaneously and soon begins to germinate, throwing out rootlets and shoots and evolving part of its absorbed water—sweating. It is then spread out and the germination allowed to proceed for from six to ten days, until the rootlets become brownish; then spread and tossed about to cool and check the fermentation. It is then put into large brick ovens or kilns, at a temperature of about 125° Fah., to dry.

The barley is now malt. It is first crushed by passing between a series of large rollers, and next is transferred to the mash tubs, where it is stirred about with water at 120° to 140° Fah., and boiling is then gradually added until all is heated to about 170° Fah. The infusion or wort is allowed to stand until the suspended matters have settled, when it is drawn off, and a second wort is obtained by treating the residuum with hot water. The first wort is boiled with the hops, the second wort is then let in, and the whole is boiled for about four hours. It is then run into the cooler, where it is quickly chilled to between 44° and 50° Fah., by running over small pipes through which cold water is continually flowing. As soon as it is properly cooled it is run into the fermenting tuns, where it is mixed with one gallon of yeast for every 20 to 25 bbls. Fermentation continues for about 20 days. At first there is a heavy froth, which soon subsides, however, leaving the surface clear. At the end of this period it is racked off into hogsheads, the yeast remaining at the bottom of the tuns. These hogsheads are allowed to stand with the bungs open until a few days before the beer is put into barrels for use, when the bungs are driven in to accumulate carbonic acid for *life*. Three varieties of beer are made.

1. "Lager," or summer beer, is prepared from the following:

Water	1 barrel.
Malt	3 bushels.
Hops	1½ to 3 lb.
Yeast	About ½ pint

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Grape sugar or glucose can be made to substitute part of the malt, and is very commonly used for this purpose; in some cases to fully one-fourth the weight of the malt. Lager beer is usually stored from four to six months:

2. "Schenk," winter, or present use beer:

Water	1 barrel.
Malt	2 to 3 bushels.
Hops	1 lb.
Yeast	About ½ pint.

It is ready for use in from four to six weeks.

3. "Bock" beer, an extra strong beer, made in small quantities and served to customers in the spring, during the interval between the giving out of the schenk beer and the tapping of the lager. In its preparation are used:

Water	1 barrel.
Malt	3½ bushels.
Hops	1 lb.
Yeast	About ½ pint.

Bock beer requires about two months in its preparation.

Starch, grape sugar or glucose, glycerine, and molasses are not unfrequently introduced into beers to replace part of the malt, while pine bark, quassia, walnut leaf, wormwood, bitter cloves, aloes, etc., are sometimes used to neutralize acidity or conceal dilution.

The color of the beer depends much upon the care with which the malt is handled and the temperature with which it is kiln dried. 90° to 100° Fah. produces pale malt; 120° to 125°, amber malt. At temperatures above this the malt becomes brown, and the wort produced from it has a similar color. The malt should be dried so that every part of it becomes crisp.

TO MAKE AND MAINTAIN A LAWN.

Nothing gives a greater charm to a country home than a nice lawn. Its soft green is a delightful relief from the bright glow of the sun and the reflected light of summer skies. To secure it requires considerable pains at the outset, and constant painstaking thereafter, but the owner will be amply rewarded for his labor and trouble.

The preparation of the soil must be thorough, as it is the very basis of success. If there be a good natural clay subsoil, with a covering of loam, this part of the work will prove comparatively easy; but if, as is often the case in newly improved grounds, there is only the bare clay to begin with, or if the subsoil be a leachy gravel, the task of preliminary preparation is not light.

Suppose the plat to be a bald piece of clay from which, in the grading, every vestige of the superficial soil has been removed. If beds of rich loam are at hand and available, the loam may be carted upon the plat to a depth of from eight to ten inches, and leveled by thorough harrowing and rolling. If good sods are convenient, small lawns may be made by sodding, in which case a depth of three or four inches of loam upon the clay, underlining the soil, will be sufficient. If suitable loam is not attainable an artificial soil may be made. The clay should be plowed when moist, or spaded into clods and allowed to bake in the sun till the lumps can be pulverized. A heavy wooden mallet or beetle is a good tool for breaking the lumps. Upon the surface of the broken clay a layer of from three to four inches of screened coal ashes should be spread and thoroughly mixed in. The pulverizing and mixing should proceed together, for if rain should chance to fall on the clay after it is beaten fine it will again form a coherent mass. The mixture of clay and coal ashes will not compact like the raw clay. The ground so prepared should next receive a layer of two or more inches of well rotted manure, or from three to four inches of street dirt, which is better if it has lain in a heap for a year or so. The manure, whether it be from the stable or from the streets, should be thoroughly mixed with the pounded clay and ashes by forking if the plat is small, or by harrowing and cross-harrowing if large, and after seeding or sodding the surface should be well rolled.

Gravelly leachy soils are the worst for lawn purposes. It will be cheaper in the end to cart clay upon the gravel to make an impervious stratum, when clay can be cheaply obtained, superimposing a suitable soil upon the clay. No matter how thorough the preparation may be, a good deal of attention is required every year to keep lawns in perfect condition.

When weeds have made their appearance, as they are sure to do when animal manure has been used or when natura sods have been laid, they must be carefully removed; and to avoid their reappearance, the subsequent fertilizing should be by artificial fertilizers. We find in the *Boston Journal of Chemistry* a recipe for a lawn fertilizing mixture which commends itself to our judgment as being among the best:

Nitrate of soda	80 lb.
Superphosphate of lime	100 "
Rectified guano	200 "
Gypsum	120 "
	500

This amount is sufficient for one acre, and should be applied once a year, or twice on poor soils. The best time is early in the spring, after the snows have melted. It must be distributed evenly and with care. Those who have small plats of ground devoted to a lawn can readily estimate the amount of fertilizing material needed if they will measure the plats. The mixture of the materials should be as perfect as possible.

A mixture of 125 lb. nitrate of soda with 150 lb. superphosphate of soda, also makes a good top-dressing for an acre of land.

The substances named should be of prime quality to render the quantities named sufficient. The superphosphate of lime is very often adulterated. The nitrate of soda should not be less than 90 per cent pure.

These fertilizers will also renovate lawns when they have partially run out, and are considered by some as better than manuring with stable manure, turning it under and seeding again, a course which is enriching, but apt to disfigure the lawn with unsightly weeds. A top-dressing with stable manure will also renovate a lawn, but it also restores the weeds, and is offensive to sight and smell. Bone meal is a capital thing for a lawn. It is odorless, clean, and gives a rich green color to the grass.

Lawns should be mowed as often as once a week, leaving the short cut grass on the plat. The wilted cuttings protect the roots from the sun, nourish them, and help the soil to retain moisture.

A lawn which has a good clay subsoil will stand very dry weather, but there are occasional seasons when it is absolutely necessary to water artificially in order to prevent the appearance of unsightly yellow spots. On small lawns this may be easily done by a garden hose; large lawns may be watered by an ordinary street sprinkling machine having wheels with very broad tires to prevent cutting the turf. Just before nightfall is the proper time for watering. During the night the water will soak down to the roots instead of evaporating rapidly, as it would in the hot sun.

AN INTERESTING REGION.

In Western Pennsylvania can be found two regions utterly unlike in their industrial characteristics, and which at the same time cannot find duplication in the world. The oil region of the Northwestern part of the State, with its wells, tanks, and pipe lines, is unique in itself, but no less so than the more restricted area, in Southwestern Pennsylvania, known as the "coke" regions. From a strip of territory three miles in width and fifty in length is drawn the solid carbon which feeds blast and smelting furnaces from Lake Champlain on the east to Omaha and St. Louis on the west, and from Canada to Tennessee. At no time since the trade was founded, some twenty years ago, has there been such activity in the Pennsylvania coke regions as at present, hence an outline of the nature and peculiarities of the industry is not out of place.

The vein of soft coal from which the famous "Connellsville" coke is wholly made, is a magnificent deposit, well defined, and easily worked. Its average thickness is 11 feet, though but 8 feet is found adapted for coking purposes. This deposit is in the form of a shallow trough, preserving a parallel with the trend of the Allegheny mountain ridge and cropping out at its northern limit, at Blairsville, Indiana County, Pa. The southern limit is found near Morgantown, W. Va. Before referring to the extent of the trade it will be as well to state what are the peculiar virtues which win for this fuel so wide a market. Its elements of excellence are threefold, namely, great proportion of fixed carbon, freedom from sulphur, free open texture, strength of fiber, and ability to resist crushing pressure. The last quality renders it invaluable in furnaces charged with immense weight of ore or metal. An analysis of the best coke of the region gives the following: Fixed carbon, 89 80; ash, 9·44: bitumen and moisture, 0·52; sulphur, 0·24; total, 100.

The growth of the trade has recently, owing to the extension of railway shipping facilities, been rapid, and from a few hundred coke ovens in 1860, the industry to-day shows a total, in round numbers, of 6,000 ovens in active operation, and between 1,500 and 2,000 ovens in process of construction. Each active oven having a weekly capacity of nine tons of coke, the present output of the region is easily found to be $9 \times 52 \times 6{,}000$, or nearly 3,000,000 tons per year. The value of the article at the ovens is at present $1.75 per ton, showing the year's output to be worth five and a quarter million dollars. Each oven represents an investment in lands, machinery, horses, cars, etc., the sum of $800, and the value of the best coke-coal lands is from $300 to $500 per acre, the last figure being only obtainable for gilt-edged property, self-draining, and near to shipping facilities. To operate these 6,000 ovens requires an army of 10,000 miners, "drawers," drivers, etc. The process of coking is one of primitive simplicity. The freshly mixed coal, without preparation of any kind, is dumped into the opening in the apex of a "beehive" oven of fire brick, and of the following dimensions: Diameter at base, 12 feet; height in center, 8 feet; opening at apex, circular and 2 feet in diameter. A "charge" of coal is 100 bushels, covering the bottom of the oven to a depth of about 18 inches. No fire is applied, the heat from the previous charge serving to ignite the coal. The "coking" process goes on for 48 hours, a limited amount of air being admitted through temporary brickwork built in the arched doorway at the base of the oven wall. Two charges of "48 hour" coke and one of "72 hour" complete an oven's weekly record, the longer charge occupying the oven during Saturday, Sunday, and Monday, and the result being a harder and more desirable grade of coke. From the 100 bushels of coal, weighing 76 pounds per bushel, result 120 bushels of coke, weighing 40 pounds to the bushel.

To transport the product of this region is a rich prize for which the three great railway lines of the country are competing. The Baltimore and Ohio for a time enjoyed a monopoly by virtue of the nearness of the Pittsburg branch; the Pennsylvania Railroad, by a branch—the Southwestern Pennsylvania Railroad—recently tapped the coveted trade; and still later the N. Y. Central, N. Y., Lake Erie and Western, and N. Y., P. and O. roads, by way of the Pittsburg and Lake Erie road, are found pushing forward toward this region of perpetual fire, sulphurous smoke, and fat freights. At present cars cannot be obtained as fast as desired, many coke firms being restricted to three days' shipments each week instead of six. Rates on coke are $1.16⅔ per ton to Pittsburg (50 miles), $3.50 per ton to Chicago, and $4 to New York. This is at the rate of $14, $42, and $48 per car respectively.

Even to the stranger hurrying by rail through this part of Pennsylvania the region is full of interest, the ceaseless fires lighting up the rugged hillsides, and the smoke covering the land like a pall. This outline of the region would be incomplete without reference to a novel project just set on foot for utilizing the daily waste of 100,000,000 cubic feet of gas thrown off by the coke ovens. Two Pittsburgers, Messrs. R. H Smith and C. C. Markle, have organized a company, applied for a charter, and also asked right of way through Pittsburg streets for their gas pipes. The gas will be brought from the coke ovens through a 24 inch main, 50 miles long, and furnished to consumers for heating purposes, also to the 971 puddling furnaces and 1,000 steam boilers of Pittsburg. By a system in which superheated steam plays a part, followed by washing, the projectors get a gas at the ovens rich in heating properties, but not suitable for illuminating purposes.

A NEW AMERICAN GEM.

At the last meeting of the New York Academy of Sciences, Mr. G. F. Kunz read a short paper upon the new mineral "hiddenite," discovered not long ago in North Carolina by Mr. Wm. E. Hidden, mineralogist. The mineral constitutes a new gem, of the emerald class, and is known in the trade as lithia-emerald, owing to the presence of lithia as one of its chemical constituents. We have seen some specimens of this gem, and they are indeed most beautiful objects to the eye. The stone has a pure delightful green tint with a liquid brilliancy that is quite distinctive and remarkable. It sells for about the same price as the diamond. Mr. Hidden tells us that the mineral is found in a narrow chimney in the rocks, not more than two feet long by two and a half inches wide, and having an inclination of almost seven degrees. We give a report of Mr. Kunz's paper in another column, and in our next SUPPLEMENT we shall publish the remarks upon the same subject by Prof. J. Lawrence Smith.

A Reporting Machine.

An interesting trial of a stenographic machine was made in the Chamber of Deputies, Paris, February 18, in the presence of M. Gambetta and a number of other officials and members. The mechanism, which is an Italian invention, is worked by a kind of key board similar to that of a small piano, and the stenographic signs, not unlike those used in the ordinary French short-hand, are automatically printed on a continuous ribbon of paper. The signs registered, of course, represent sounds, irrespective of spelling, and the machine can be used by a person unacquainted with the language spoken. The daughter of the inventor worked the machine successfully, taking down a speech read, at average speed, in Italian, and one read in French by M. Gambetta, she being ignorant of the latter language. A comparison between the speed of the machine and that of the short-hand writers of the Chamber proved favorable to the former. Further experiments will be made with a view to a possible adoption of the apparatus, which is already in use in the Italian Chambers.

The Arlberg Tunnel.

The preparatory operations having been finished, the work of boring the great tunnel through the Arlberg has now actually commenced. This tunnel will be one of the longest in the world, though not so long as that of St. Gothard. So far the operations on the eastern side af the Arlberg have progressed very favorably. The rock there found is a micaceous slate, through which the contractors find it possible to advance at the rate of from three to four meters a day. On the western side, on the other hand, the advance of the tunnel is retarded and the operations frequently disturbed by the repeated downrush of large quantities of water. The contractors were warned before commencing the work that this was only to be expected. The geologists further advised that the tunnel should be carried through a lower stratum of rocks, which are of denser material and watertight, but their warnings were, unfortunately, disregarded.—*Swiss Times.*

Pulverized Coal in Furnaces.

The *Iron Age* learns that Messrs. Alexandre & Sons are making some very successful experiments at the Washington Iron Works with pulverized coal. The coal is blown into a furnace and burns freely with a strong heat, but the apparatus is being altered to secure still better results, after which the process will be practically tested on one of the Havana steamers. The coal is fed from a perpendicular funnel, and the air enters horizontally from the side.

L. B. Boomer.

Mr. L. B. Boomer, of Chicago, late President of the American Bridge Company, died in this city, March 6. A large number of the great railway and other bridges in Illinois, Iowa, Wisconsin, Michigan, and other Western States were built by him.

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AMERICAN INDUSTRIES.—No. 68.

PROPRIETARY SPECIALTIES.

While the production of that class of articles known as proprietary specialties may involve no machinery or processes not in common use by all manufacturers of drugs, chemicals, and the like, the business of advertising and selling them in a large and successful way does involve industrial operations of such magnitude and completeness of organization as to bring the business fairly within the scope of great industries. And since the business methods developed in creating and supplying a world-wide market for a proprietary specialty are in a large measure applicable to the work of making known any article of manufacture the general use of which is desired, a study of the operations of a representative house in this branch of trade must have at least a suggestive value to all manufacturers whose products are capable of winning general acceptance if properly placed before the public. The accompanying illustrations exhibit the principal departments of the business of Messrs. A. Vogeler & Co., Baltimore, Md., one of the largest manufacturers of proprietary specialties in the country. The offices and works of the firm are situated on West Lombard street (Nos. 184 and 186), and run back the distance of a long business block to a shipping street in the rear. The main building has a front of fifty feet, is four stories high above ground, and is constructed of pressed brick with Ohio stone trimmings. In the front part of the ground floor is a suite of admirably appointed offices, beautifully fitted up and handsomely furnished. The reception parlor is especially noticeable for the richness of its furnishings and its perfection of comfort.

Along the front hall are grouped the offices of the managing partner, his private secretary, and the cashier, separated from the other departments on the same floor by a plate glass partition. On the further side of this partition is the literary department, to which the corps of translators, and the staff of correspondents and reporters throughout the world, submit their work for revision and approval, and where the advertisements and other work pertaining to the department are prepared. The offices of this department contain a comprehensive and carefully selected library of books and periodicals, and in all their appointments would do credit to any publishing house. On the same floor is the mailing supply department, where a corps of lady assistants make ready for the mails the vast correspondence of the house, circulars, documents, and the like. The shipping department, bindery, box factory, frame and show card factory, etc., are in the rear building, which is three-fourths the size of the main structure; also a large fireproof storage vault for chemicals and an extra laboratory.

The main laboratory is on the fourth floor of the front building, connected with the extra laboratory by a bridge or corridor. Here, as shown in our illustration, are the retorts, stills, and condensers, percolators and funnels, stock and distributing cans, and other appointments of a well-ordered laboratory, with ample facilities for the swift and easy handling of crude products and completed preparations, particularly the St. Jacobs Oil, which is the chief specialty of Messrs. Vogeler & Co. The employes of the laboratory are under the training and supervision of a skillful chemist, who assays every constituent of the Oil to insure uniformity in the product. The finished Oil, after the final filtering, is run into large supply cans, whence it is drawn into patent bottling machines in its passage to the bottling and labeling department.

The distinguishing feature of the house, however, and the one in which it takes great pride, is the advertising department, the administration of which is a vast business by itself. This department occupies the second floor of the main building. Approaching this floor by an ample stairway from the front one passes through a wide hall, from which, at right angles, a narrower hall leads to the manager's office. This office, like those on the main floor, is one of a communicating series, and is well equipped and comfortably furnished as to decoration and fitting, the floor being covered with Brussels carpet and the walls with pictures. Adjoining are the offices of the stenographic reporters, corresponding clerks, and bookkeepers, all perfectly appointed. Separated from the offices by a handsome walnut and ground glass partition is a spacious room, 90 by 50 feet, which is devoted to the filing and control of newspapers. This room contains 10,000 pigeonholes, each one having over the top a small sliding sign, upon which is printed the name of the paper for which it is intended. Every paper in which the advertisements of this house appear comes regularly to this department, and is carefully examined, marked, entered, and filed. A corps of lady clerks are engaged in this special service, under the supervision of a gentleman of long experience in such matters. All derelictions on the part of advertising papers are reported to the manager, who at once presents his complaint to the paper in fault.

The unvarying courtesy exhibited toward publishers, and the exceptional method of paying advertising bills without waiting for the rendering of statements, have established the most cordial relations between the press and the house. No house could be more strict and exacting in its demands, and surely none is more prompt in fulfilling its obligations.

The system of book-keeping, carrying on correspondence and conducting newspaper advertising which obtains here, is original in conception and execution. Of the many thousands of letters and documents always on file, any one of them, whether unimportant or otherwise, can be instantly referred to, considered, and returned to its proper place. A daily and weekly permanent account is kept with every paper in which the advertisements of the house appear, and at a single glance the exact state of the work is comprehended. This system involves the maintenance of a set of large books—22 in number—containing over 12,000 accounts, for the preservation of which a safe specially constructed is provided. Every letter and every contract is dictated to stenographic correspondents by the manager, and thus the vast amount of correspondence is practically under the control of a single head. The house points with especial pride to the expressed opinions of reliable advertising experts that its advertising department has not its equal anywhere. As an evidence, we cite from the Chicago *Inter-Ocean* on this point. "In its magnitude, conception, system, and originality it is vastly superior to anything of the kind in America. Any one familiar with this kind of business can understand the vast amount of detail in such a department, and only such can appreciate the tact and business ability that systematized and organized it so perfectly."

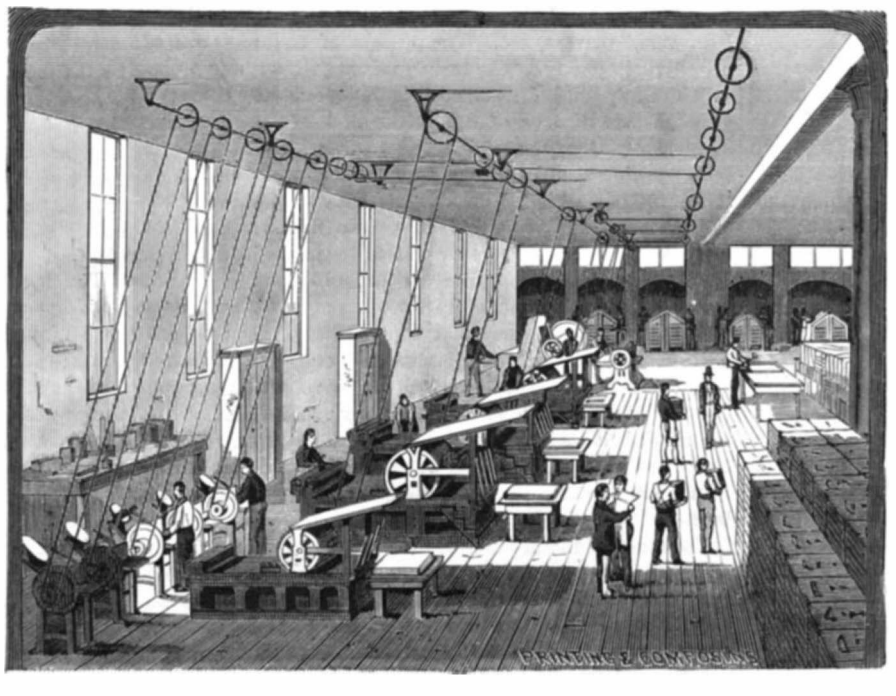
Every possible convenience to facilitate business is here seen. Speaking tubes, dumb waiters for communicating with the various other departments, libraries of reference, safes for the preservation of valuable documents and books, and other conveniences are provided.

The bottling and labeling department is situated in the main building, and is noticeable chiefly for the swift and very expeditious manner in which the product is prepared for the dealer after leaving the hands of the compounders. Connected with the main supply cans in the laboratory by tin lined pipes, are ball-faucet boxes with adjustable automatic stop cocks governing the flow of the liquid through which the oil runs into patent bottle filling machines. One attendant to each machine is kept constantly busy in removing the bottles as they become filled.

The bottles come to the filling room from the factory ready for immediate use. After they have been filled as described,

they are removed in large trays to the corking tables, where they are securely corked and passed on to the long labeling tables. Here young ladies deftly handle the bottles, applying to each the regular label, wrap round it a circular of directions in eleven languages, and put on it an attractive lithographed wrapper. The finished bottles, in immense heaps, are then carried along to the packing tables and placed in machine-made wooden boxes, one dozen bottles in each box, and these boxes are then packed in a stout wooden case, each containing six of the smaller boxes or one-half a gross of the article ready for shipment.

One of the most interesting features of the whole establishment is the printing department. It is in the basement of the main structure, and is well appointed in every respect and admirably ventilated. Windows admit the light from three sides, and the apartment is wainscoted in solid wood. Here the printing of the house is done, for which purpose thirteen steam presses are kept running day and night, printing labels, posters, medical almanacs, and advertising work of every description, including a very considerable amount of "color" work, etc., all of which is "set up" by their own compositors. This advertising matter is furnished to patrons in eleven different languages. In this department also, are steam binding, stitching, cutting, and book



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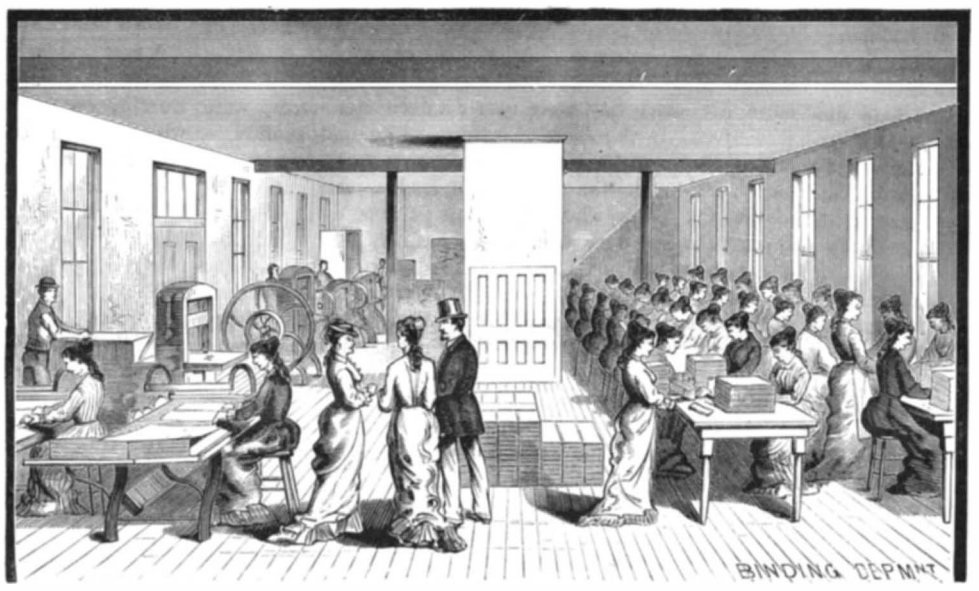
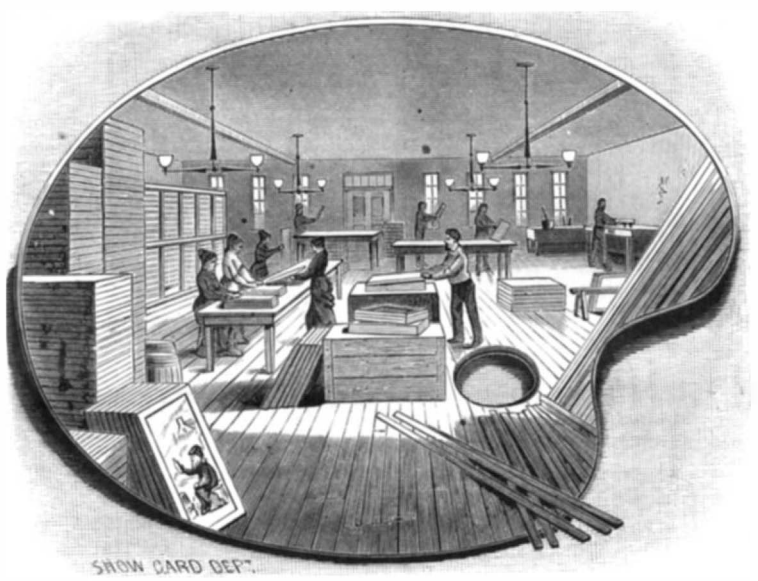
trimming machines, driven by a fifty-five horse power engine manufactured expressly for the firm. The boiler is located under the rear pavement, remote from the press room, thus preventing the heat and dust from entering the department. The same exact methods and system are observed in the working of this branch of the establishment as in every other. The bindery is located in the rear building or annex. Here the pamphlets, almanacs, etc., are stitched and covered, giving employment to a large number of young women, whose skill and swiftness in their work are admirable to witness.



The show card department occupies two floors of the rear building. Framed chromo-lithographic show cards and other work of a similar nature are turned out here in immense quantities. The moulding is bought in the rough, and then smoothed, polished, and finished, plain, in gilt, or in colors, as ordered. It is then cut into proper lengths by suitable machinery, mitered, and joined, and made ready for the reception of the lithographed cards and other devices for framing. These cards, as received from the printing department and chromo printers, are stretched, sized, varnished, and mounted, and then are passed to the packing department, where they are boxed, an abbreviated description being stenciled upon the package. Thence they go to the shipping department for address and shipment.

It might appear upon cursory thought that a business of so much detail, and separated by necessity into so many departments, each distinct in its nature and methods from all the others, would unavoidably run into confusion at some points, but such is not the case in this concern. While each department is responsible to its particular head for its running and results, the several heads or chiefs are responsible in return directly to the managing partner of the house, so that, though the operations of the house extend nearly over the whole world, the vast business is carried on with the utmost smoothness and regularity.



NEW SWINGING GATE.

A simple and very effective automatic gate is represented in the annexed engraving. It presents none of the objectionable features found in the class of gates operated from overhead, and has but few parts, all of which are substantial and durable.

Fig. 1 shows the gate in perspective, the horizontal connecting rods being exposed to show the connection of the various parts. Fig. 2 is a side elevation of the upper gate hinge, and Fig. 3 is a plan view of the same. Fig. 4 shows the latch used in connection with the automatic gate. This gate can be made of wood or iron, or of both materials combined, and it may be of any style to correspond in general design with the fence to which it is applied.

The gate is supported at the top by a bracket, A, attached to the style and apertured to receive the pintle of the bar, B, the latter having a heart-shaped opening for receiving the pintle of the bracket, C. The bar, B, is rigidly attached to the upper end of vertical rod, D, which is offset to bring its lower portion axially in line with the pintle of the bracket, C. The rod, D, is journaled near its lower end in a bracket secured to the bottom of the post, and carries a horizontal stud upon which rests the portion of the hinge attached to the lower part of the gate. This part of the hinge is forked to embrace the rod, D, and bent downward forming inclined planes, and when the rod is turned the horizontal pin passes under one or the other of the inclines. This combination assists in opening or closing the gate, as will presently be described. The trip rods, E, consist of iron or steel rods bent so as to form two cranks at right angles to each other, and one end of each rod has a lever arm connected by a horizontal rod with a T-lever secured to the bottom of the vertical rod, D. The horizontal connecting rods are made adjustable as to length to compensate for any accidental change in the position of the trip rod.

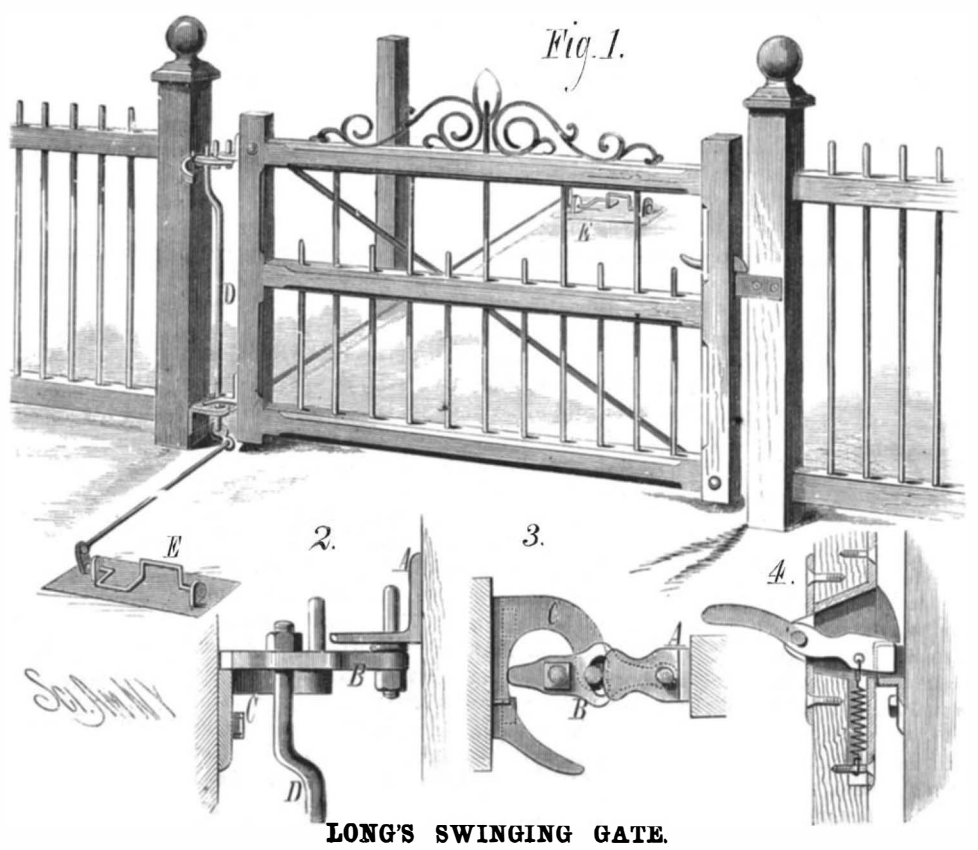
This gate is readily operated by a light carriage containing one person, and its action is quick and sure. The operation of the gate is as follows: The vehicle wheels operate, through the trip rods, E, and the connecting rods to turn the vertical rod, D, in the usual manner of such gates. It is well understood by those familiar with such devices that the vehicle wheel forces the trip rod entirely down almost instantaneously, and retains it there only momentarily, and therefore that there is no active pressure on the gate except for a very limited space of time, in which it is impossible for the gate to swing entirely open or shut. The result has been that such gates would often remain partially open by reason of a reaction of the mechanism after the wheel had left the trip rod. By means of the bar, B, having the heart-shaped orifice and catch formed on the bracket, C, this difficulty is avoided. The mechanism is operated at once to its full extent by the wheel impact upon the trip rods, and the vertical rod, D, is consequently given the one fourth revolution necessary to turn the gate instantaneously and before the gate has acquired any perceptible swinging motion. This moves the bar, B, on its pivot, so that the pivot occupies one of the sides of the heart-shaped orifice instead of its apex, and the bar is thus made to move rearwardly a sufficient distance so that its point will engage with the catch formed on the bracket, C, and is thereby held in position until the gate swings into position, when it draws the bar forward and the pivot resumes its place in the apex of the heart-shaped opening.

The horizontal stud in the rod, D, turns around under the inclined portion of the lower hinge, so that its face, which rests upon the stud, has a tendency to slide upon the stud, and thus accelerate the motion of the gate, or enable the same to be operated when tilted to a less angle than would otherwise be necessary.

The gate latch is lifted out of its notch when the free end of the gate is raised by the tilting mechanism, so that it offers no impediment to the opening of the gate by a passing carriage.

A double gate may be made on this plan by simply adding another arm to the lever at the bottom of the rod, D, and connecting it by a rod to a corresponding arm of a similar mechanism on the second gate.

This gate was recently patented by Mr. Nathan H. Long, of Muncie, Indiana.



LONG'S SWINGING GATE.

MISCELLANEOUS INVENTIONS.

Mr. William Dewart, of Fenelon Falls, Ontario, Canada, has patented an improvement in ventilating houses, by which purer outside air than that immediately contiguous to buildings is supplied to interiors. He passes the air through a conservatory, in which the plants purify the air, using a pipe with an outside flaring end for introducing the air to the plants, and pumping the air so purified into the building to be ventilated.

Mr. Harrison Owens, of Fort Worth, Texas, has patented a coffee roaster, which can be used in the oven of an ordinary stove, and which retains the aroma of the coffee. The coffee is roasted in a revolving cylinder provided with a hollow trunnion and a semi-tubular tester introduced through the trunnion, which tester serves as a handle for revolving the cylinder, and can be withdrawn with sample to determine the progress of the roasting.

Mr. Francis A. Dupuy, of Ironton, Ohio, has patented a leather blacking frame, which enables the flesh side of the leather to be kept clean, and saves the time usually expended in wiping the table commonly used. It is a rectangular frame with cross pieces and longitudinal wires tightened over the crosspieces by a taking-up device.

Mr. Charles F. Stillman, of Plainfield, N. J., has patented a trotting sulky in which the frame, axle, and shafts are so constructed and arranged as to afford more room for the rear part of the horse and permit the animal to be hitched nearer to the axis of the wheels than has heretofore been possible, thus avoiding interference with his gait and obtaining greater ease of draught.

Mr. William B. Runyan, of Pensacola, Fla., has patented a timber crib designed to prevent loss from the breaking asunder of timber rafts. It is a rectangular crib or cage composed of timbers securely fastened together, and a series of cross-clamps, with screws and nuts for holding the confined timber in place, one end of the crib being hinged, so that it may be opened for loading and unloading, the hinged end being provided with a roller to facilitate the moving of the timber. Both ends of the crib may be hinged when three lengths of lumber are desired to be loaded.

Mr. James A. McCaffrey, of Philadelphia, Pa., has patented an ice sandal. The sole is of wood, leather, or rubber, etc., perforated with numerous small holes. The objection to metal spikes is thus avoided. The sandal can be worn over other foot gear.

Mr. Frank S. Osborn, of Bolivar, N. Y., has patented a horse poke. An adjustable sectional collar is held in place upon the horse by suitable bands or straps, and has a forward and upward projecting pivoted bar or stale whose butt rests on a sharp-pointed spring, which pierces the horse's breast when the free end of the stale is pressed downward as the horse attempts to get over a fence.

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HIDDENITE.—A NEW MINERAL.*

When Dr. J. Lawrence Smith wrote his paper on hiddenite, he embraced in it all the facts then developed.

His announcement was written fully two months prior to its publication, and it was in this short interval, and also from subsequent work at the locality that the points I have to add to this paper have been developed by Mr. W. E. Hidden.

The mistake of calling this mineral diopside was a very excusable one, as spodumene had never before been found unaltered, transparent, and of such color, and as here discovered resembling nothing so much as diopside, which latter mineral is always transparent, green, and often worthy of use as a gem. Spodumene is also closely isomorphous with diopside, differing only a fraction of a degree in its prismatic angle, and like it also in its easy cleavage in two directions.

The true character of this new variety of spodumene was only discovered when an attempt was made to find the cause of its beautiful color by chemical analysis.

Hiddenite or lithia-emerald is to the species spodumene precisely what emerald is to the species beryl, being only a beautiful green variety.

Beryl, as a mineral species, is of very common occurrence, much more so than the species spodumene; both are found in large crystals, but either opaque or with only a trace of color.

It is strange, in fact remarkable, that the species spodumene, which has always been to mineralogists a very unsatisfactory mineral in form and color, should at last prove to be one of the most beautiful of minerals, in fact, a *new gem stone.*

It is to-day not only the finest and most beautiful of American gem stones, but like the emerald, has taken its place among the gems of highest rank and value.

Its color is one peculiar to itself, differing from the beryl emerald in its vividness or in a quality of color that I might better term ethereal.

I know of nothing that I can better liken the color of this new gem to than the beautiful color produced by falling bits of uranine in water. It is a green of rare brilliancy.

The cause of color is not as yet known, but it is probably caused by the same agent that produces the color in variscite *i. e.*, vanadium.

It might be asked why the new mineral has been so readily accepted as a gem of the first rank. I would answer, that it possesses all the characteristics which are considered vital in a gem stone, *i. e.*, perfection of color, hardness, transparency, and rarity.

Only a very small number have thus far been found, scarcely more than enough to properly introduce it as a gem.

As regards value, it has been sold for the price of diamonds of equal size, and in one instance a stone not entirely perfect, of about 2½ karats weight, was sold at the rate of over $125 a karat.

As yet the only dependence for procuring these gems is the narrow vein (only 2½ inches thick and 2 feet in lateral extension) found by Mr. Hidden in Alexander County, North Carolina.

The lapidaries have had some difficulty in cutting this stone, its perfect cleavage in two directions sometimes causing it to cleave while undergoing the strain and pressure necessary in the cutting process.

They also find the stone harder across the ends than across the sides.

Its name in the gem mart is lithia-emerald. It was so named from the presence in it of over seven per cent of lithia, an element wholly absent in the beryl emerald.

The crystals in their natural state will be known to mineralogists under the name given to it by Dr. Smith, viz., hiddenite.

This is the first *purely American gem*, and its remarkable beauty merits our highest praise.

* Read before the New York Academy of Sciences, at a regular meeting held on March 7, 1881, by Geo. F. Kunz (mineralogist), with Tiffany & Co., New York.

Earache.

"In the course of practice you will often be called upon to attend a case of earache. This means, pathologically speaking, acute inflammation of the membrana tympani. Now, in such a case you may quickly subdue the inflammation, relieve the patient from the excruciating pain he is suffering, and save him, perhaps, from subsequent confirmed deafness. The treatment from which such a very desirable result may be obtained is similar to that which you will find so beneficial in analogous cases of eye disease; viz., leeches behind the ear, hydrarg c. cretâ and belladonna powders, with warm fomentations."—*Prof. Wharton Jones, F.R.C.S., F.R.S., in London Lancet.*

The Wasted Energy of Springs.

The State of Missouri contains a large number of strong-flowing fountains, Bryce's spring, on the Niaugua river, being, the *Age of Steel* says, probably the largest. It discharges 10,927,000 cubic feet a day, and flows away a swift stream forty-two yards wide. Its temperature is steady at 60° Fah., and ice never forms near it to impede machinery. Its flow is regular. Though the average annual rainfall of the State is forty-one inches, springs constitute the reliance of the streams for a steadfast flow of water. Several hundred springs are known to be large and forcible enough to supply the power required to run an ordinary mill or factory.

SINGULAR FLOWER-LIKE FORMS OF ICE.

In the beginning of December of the past year, says Prof. Bombicci, in the *Rivista Scientifico-Industriale*, the whole surface of Southern Italy may be said to have been converted into a vast field of crystalline frost, giving the country an aspect at the time well deserving of the appellation of the *garden of Europe.* Infinite numbers of white and semitransparent corollas, resembling camellias and roses, of dazzling whiteness, and not rarely of very large size (since they were nearly a decimeter across), were seen spread in the form of a pure white and semitransparent sheet over a deep layer of snow throughout Lombardy, Piedmont, the province of Emilia, and the valley of the Po. Everywhere that this curious sheet of frost appeared there were seen these beautiful snow flowers. Their leaves and petals covered the fields in the country and the streets and squares of the city, the roofs and balconies of every house, and every hill and vale. Every hillock of turf was ornamented with corollas having transparent petals, and every cavity in the earth became a geode. One might have imagined that there had been a magic apparition of petrified flowers, some of them transformed into marble or alabaster, and others into porcelain or glass. Either in their masses or in their separate parts was reproduced the graceful curve of the most beautiful camellia, along with angularity of the ligneous scales of the pine cone, and the plane and intricate laminate crystallization of certain salts. Two types of aggregations of

SNOW FLOWERS.

laminæ could be always distinguished: (1) that of the rose corolla, in whose laminæ, as in true petals, a very delicate curvature characterized both the superficies and the margin; and (2) the type with intricately-converging plane laminæ, in all of whose rigid diaphanous plates were exhibited striæ radiating from the base to the circumference, and zones of various degrees of transparency running around the circumference. Both of these remarkable forms are shown in the accompanying figure. In addition to these forms, the phenomenon, which lasted eleven days, was accompanied by the usual beautiful star-like snow crystals and myriads of plane hexagonal laminæ, with facets that presented a brilliant appearance as the sun shone upon them.

The Hudson River Tunnel.

The Hudson River Tunnel Company, after numerous delays, have, according to the *Daily Graphic* of March 8, succeeded in securing the lease from the Dock Department of a strip of land 100 feet square at the foot of Morton street, in this city, and will begin work within the next fortnight on the shaft on this side of the river.

The working shaft will be sunk at the foot of Morton street, near Pier No. 42, and will be much larger than the one on the New Jersey side of the Hudson, being forty feet in diameter, and will be excavated to a depth of seventy feet. On March 7 the engine to be employed in furnishing air for the air lock and in hoisting the earth from the well, was placed on the grounds, which have been inclosed, and another cargo of Haverstraw brick, in addition to 1,000,000 already stored there, has arrived.

The experience gained on the New Jersey side will render the work on this side of the river comparatively easy. The only obstacle of any account to be encountered and overcome is the loose silt and mud which extends thirty feet below low water mark. At a depth of sixty feet solid ground is found, but to make assurance doubly sure, the excavation of the shaft will extend ten feet further down, and from that point work will begin under the bed of the river. It is confidently expected that the shaft will be so far completed by the middle of June that work on the tunnel on this side will be begun, and if present calculations are not at fault, the New York and the New Jersey ends will meet in about the middle of the river early in 1884.

Work on the New Jersey side has been pushed ahead without intermission, day or night, since the fatal collapse of last fall, and on March 8) the assistant engineer in charge of the works reported that the south tunnel is now completed 330 feet under the river, and that the north tunnel is arched and walled for a distance of 300 feet. Two hundred men are employed, and an average of four feet is accomplished each day. When operations commence on this side between eight and ten feet of tunnel will be completed per day. The precise route to be adopted from the foot of Morton street to Broadway, the New York terminus, is yet to be decided upon, but it is generally believed that it will be either through Bleecker street, Amity, or Fourth street.

LONG DISTANCE TELEPHONE SYSTEM OF DR. HERZ.

A new system of telephony, invented by Dr. Herz, is attracting a great deal of attention among electricians in Europe, on account of the surprising distances through which telephonic communication has been maintained by it. The first announcement of the invention in the papers of September last stated that conversation had been carried on through the cable connecting Brest and Penzance, a thing generally considered impossible, on account of the comparatively sluggish action of the electric current in submerged cables. The experiment proved sufficiently successful to encourage Dr. Herz to push forward his investigations, and, according to foreign advices, he has been rewarded by being enabled to carry on conversation through an actual distance of over six hundred miles over circuits having no special adaptation to telephonic communication.

Dr. Herz has apparently solved two difficult problems: that of increasing the amplitude of electrical vibrations, and of neutralizing currents foreign to the telephonic circuit. The first he accomplishes by a microphonic transmitter with multiple contacts, and a system of derived currents; the second by interrupting the line and interposing condensers or diffusers. We have received an extended illustrated description of this interesting invention, written by Th. Du Moncel, which will be published in full in SUPPLEMENT 274.

American Manufactures in India.

To the Editor of the Scientific American:

It is a pleasure to me to be able to tell our American manufacturers that their goods, in all branches of trade, find a ready market and have a preference here in India. There is a lack of goods sent out here, I mean of everything which would be adaptable to the country. I have given the subject due consideration, and what I would recommend would be the establishment of an amalgamated company, to consist of all departments of manufactures. All classes of American wares are preferred. Look, for instance, at the large number of stoves that have been sold out here; also, hardware of all kinds, ironmongery, etc. I need only refer you to the exports from the United States to India. The establishment of an American emporium here of purely American manufactured goods and products would be a success financially. Look at the demand for American dried fruits, for instance. What little does come gets into the hands of a very few dealers; and I can tell you I have often paid 50 cents a pound for dried apples, while only the other day I paid $1.50 for a two-pound tin of Chicago salt beef.

Great quantities of goods are sold here labeled American, when they are not; for instance, I went into what is called a respectable establishment about a month ago to purchase an American stove. I was shown bogus articles. I told the dealer that no American would ever export such rubbish. I put the big blade of my knife full length into many of the joints, and others were filled in; the utensils were cut so uneven that on one side of a pot I looked at it was scarcely one-sixteenth, while on the other it was fully three-eighths. The way to stop this would be to establish a real sound American trading company to embrace every description of manufactures.

A. LYLE.

Secunderabad, Nizam Dominions, East India.

Heavy Shipment of Grain on the Mississippi.

On the morning of March 6, the towboat Oakland, of the St. Louis and New Orleans Transportation line, left the former city with 263,000 bushels of corn and 90 bushels of wheat for foreign account. The grain was stowed in eight barges. The shipment exceeded by over 50,000 bushels any previous shipment, and the tow was the largest ever floated on the Mississippi River. It is said that three-quarters of the 1,100,000 bushels of wheat in the elevators of St. Louis will be exported by way of New Orleans.

Scratches or Cracked Heels in Horses.

A Canadian correspondent gives the following simple remedy for scratches in horses: "Having tried many lotions, etc., only to obtain temporary relief for my horse, I concluded to try a mixture of flowers of sulphur and glycerine, which I mixed into a paste, using sufficient glycerine to give it a glossy appearance, and the results I obtained in a short time were truly wonderful. I apply this paste at night, and in the morning before going out I apply plain glycerine."

BEET SUGAR INDUSTRY IN CANADA.—The Canadian House of Commons has passed a resolution to exempt beet sugar from excise duty for eight years. This to encourage the manufacture of beet sugar in Canada.

THE BANISHMENT OF BEES.—At the petition of the Parisian refiners of beet root sugar, the Prefect of the Seine has proscribed bees in the neighborhood of the city. A single refiner in the 13th arrondissement estimates his losses at 25,000 francs.

PROFESSOR KLEBS, of Prague, has discovered peculiar microbia in the remains of patients who have died of typhoid fever. They do not occur in the bodies of persons who have been carried off by other diseases.

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UTILIZATION OF THE WASTE OF CITIES.

This has become a very trite subject, for in so far as our city is concerned, it ever and anon comes up for discussion in our newspapers and magazines, and yet the problem, what to do with our city waste, is not yet answered. That much apparently valuable matter in the shape of street sweepings, sewage, garbage, and ashes goes to waste, and at the same time imposes an enormous cost upon the city for its removal, is apparent to all tax payers. How to get rid of it without involving such a cost, and, if possible, to realize some pecuniary profit from it, is the problem we so frequently hear discussed without any available results arising from the discussion. There are various reasons for this. Too often the subject is approached by men who, seeing the immense quantity of fertilizing material going to waste in a city of a million inhabitants, wonder why the farmers and gardeners in our immediate vicinity do not clamor to get it, and compete for it to such an extent as to make it a source of revenue to the city. These gentlemen who know far more about law, banking, and selling goods than they do about agriculture, abuse the city authorities for expending large sums of money in throwing it away instead of making a profit from it. The authorities are indeed as ignorant as themselves on agricultural matters, but having to get rid of it, they take the, to them, shortest and easiest course of carrying much of it to sea and throwing it overboard, to assist in making bars and similar impediments to a safe approach to our harbor, or in rendering our beaches filthy and malarious. Now we do not propose to solve the problem we have approached, but only to offer some suggestions and data that may assist in its solution, and turn the attention of those who have given it some consideration to other means of attaining the ends they have in view.

In the first and most important place, the whole subject becomes one of merely pecuniary consideration as to values, the same as any other article of merchandise.

The question then arises: Is the material worth to the farmer or gardener the cost of collecting, handling, and transportation? Now, the farmers and gardeners in the vicinity of our large cities are as intelligent and shrewd business men in their line as are our city residents in buying and selling merchandise. They quickly invest $10 or $15 in a barrelful of some new variety of potato, if they are assured that it is really earlier or a better late keeper than any other they know of. Four to fifteen dollars a pound for the right kind of cabbage seed for their purposes they do not begrudge; and a dollar or two an ounce for tomato or cauliflower seed is a mere bagatelle, so that it be just what they want. They try and use the best manures, thinking nothing of spending $50 to $100 per acre every year on their crops, knowing well that without the expenditure of capital in crude material and labor they cannot carry on their business, and especially when they have to compete with distant sections which steam navigation and railroads have almost brought adjoining us. As in every other business, a dollar saved is a dollar gained; so with these men, they look keenly to every saving. If, therefore, these men could save money by using the city's waste they would most assuredly do so. But they do not use it, simply because it is not worth the money it costs to get it, on account of its small fertilizing power and its great bulk as compared with other manures. Great stress has been laid upon the manurial value of the

STREET SWEEPINGS.

Let us see of what they are composed. Mainly of horse droppings, it will be said. By no means so; two-thirds of it is sand, and the one-third left has been ground into fine powder by the wheels of the vehicles, and its fertilizing qualities largely dried out of it by the sun or wind, or washed out of it by the rain or snow. A large quantity of the sand works up through the interstices of the paving blocks; in every repair to a street the sand is spread over it, and when swept up it is put with the better sweepings from other streets; it is so when gas or water pipes are laid, or when houses are built or repairing; the *débris* goes with the sweepings, overloading it with material which is of no earthly use to the farmer, and for which he must pay for the handling and transportation. If laws were passed and strictly enforced requiring builders and those who upturn the pavements to remove the *debris* as fast as it accumulates, and every street was swept every day or two, the horse droppings would have some manurial value and be worth paying for. But another element comes in which would deteriorate their value for some soils; and that is, the great amount of iron in them, produced by the constant attrition of the tires of the wheels of the vehicles and the shoes of the horses upon the stone pavement. It is something astonishing, the quantity of iron that can be got out by a magnet from a pound or two of dry sweepings taken from a much traveled street.

THE GARBAGE

of the city consists of vegetable matter, such as the refuse of the fruit and vegetables used, tea leaves, coffee grounds, and such like, with a large percentage of bones. It has been proposed to burn all this and use the ashes as manure. But this, so far as tried, has not been a success, because of the cost, as necessarily all the water must be dried out of it before it can be burned to ashes. If it were partially dried by passing superheated steam through it, and so also be partially cooked, it might be compressed into bales and so be readily and cheaply transported. Composted with animal manures it would become a very efficient manure. Here again the law would have to be strictly enforced, requiring the garbage to be kept in vessels unmixed with ashes or similar materials. Proper machinery could be constructed by which the bones could be taken out of it; these amount to a very large quantity daily in a city like this, and as every body knows, form, when grounod dissolved, one of the best manures known. Less the water, the green vegetable matter composing the garbage is a good manure, as it contains a much greater percentage of potash than does the woody trunks and branches of the trees from which we derive our principal supply of that article. It is to this that the efficiency of the practice of plowing under green crops for fertilizing purposes is principally due. The garbage of the city is of far more value than the street sweepings, and at the same time it is more troublesome to manage. Towing it out to sea and throwing it overboard is a most egregious act of ignorance and stupidity.

Suggestions as to the disposal of city sewage and ashes we reserve for a future article.

The Grand Canal de l'Est.

A complete history of the origin and construction of the great French canal from the Marne to the Rhine and the Canal de l'Est, is now published under the title of "Alimentation du Canal de la Marne au Rhin et du Canal de l'Est," by M. Alfred Picard. This canal was conceived by M. Frécot, and undertaken for the purpose of making good the loss of the Strasburg junction of the two canals from the Rhone and the Marne to the Rhine, by the secession of Alsace and Lorraine after the war of 1870. It provides a waterway within the limits of the new frontier between the North Sea and the Mediterranean. Commencing on the Meuse, near the Belgian frontier, a little below Ginet, it skirts Mezieres, Sedan, Commercy, Toul, and Nancy, passes near Epinal, and terminates at Port-sur-Saône, on the well known tributary of the Rhone. The total length is about 290 miles, and the estimated cost is a million francs. The section between the Meuse and the canal from the Marne to the Rhine has been constructed, and the whole work is expected to be finished in less than two years.

Use of the Salts of Vanadium in the Arts.

This paper, a compilation by the Swedish Vanadium Company, Aktie Bolaget Urda, of Stockholm, contains some important information on aniline blacks. For an aniline black which does not turn green, which requires no subsequent treatment liable to degrade the black and soil the whites, the following process is recommended:

Water, 5,500 grammes; white starch, 1,250 grammes; dark calcined starch, 420 grammes. Boil, and when cooled down to 50 add aniline oil (of d'Andiran and Wegelin, Mulhouse), 800 grammes; hydrochloric acid, 21° B., 800 grammes. When cold add further: sodium chlorate, 420 grammes; boiling water, 500 grammes. And, at the moment of using, add vanadic solution, 10 grammes per liter, 200 grammes. The goods are aged for two days, passed through bichromate solution at 5 grammes per liter at 70°, and soaped. Instead of adding to the aniline oil the above-mentioned proportion of hydrochloric acid, it is well to neutralize the aniline by adding the acid gradually, till a few drops of the liquid introduced into a very dilute solution of Paris violet (1 gramme per liter) turns the violet color to a greenish blue. The "vanadic solution" above mentioned is obtained by dissolving, *e. g.*, 10 grammes ammonium vanadiate in 40 grammes hydrochloric acid, slightly diluted, in a porcelain capsule at a gentle heat, and adding glycerine in small dose, keeping the liquid to a boil till its color passes to a deep green and all the particles are dissolved. The whole is then made up with water to 1 liter and preserved in a stoppered bottle.

Electric Light on a Buoy.

Rear Admiral Nichols has issued the following: "An automatic buoy, having a ten-inch whistle, and a glass globe for an electric light on the top, has been moored in thirteen fathoms of water, south half east from the Sandy Hook Lightship, and about three cables' distance from her. The inventor of this buoy claims that it will show an intermittent electric light, the generation being operated by the action of the waves. The Lighthouse Board has permitted this buoy (the private property of the inventor) to be placed where it is in order that its practical advantages, if any, may be tested, and that its operations may be observed and reported upon by the people on board the lightship. The Lighthouse Board is not responsible for it as an aid to navigation. Pilots and navigators are respectfully requested to send to this office the results of their observations on this buoy."

The general construction is understood to be as follows: By the motion of the buoy, due to its rise and fall on the waves, air is compressed within the buoy, which acts intermittently to drive an electric engine and also to sound a whistle. When the air reaches a certain degree of compression the engine rotates and the carbon in the globe brilliantly glows; at the same time the whistle sounds.

THE CAT AS A PEST DISTRIBUTER.—The domestic cat is again charged with spreading disease, this time by the physicians of a district in Sullivan county, this State, where small-pox is epidemic. In several cases the proof is pretty strong that house cats carried the pest, and owners of cats have been warned to keep them from roaming about.

The Castes and Trades of India.

On the 10th of February a lecture on Indian castes and trades was delivered at the London Institution by Professor Monier Williams, C.I.E. He said India had been described as a poor country on the verge of bankruptcy, whereas it was really a rich country, with a poor population. Its potential wealth was incalculable. Indian art was in an advanced state long before Europe had emerged from barbarism; but at present the want of capital and the dislike to machinery were fatal to successful competition with European artisans, though Indian workmen were content with far lower wages. The secret of the beauty of Indian art lay in delicacy of touch and manipulation. The hand was still the chief implement in India. No European machinery ought to supersede it, and Indian art ought never to abandon its own national traditions and pure taste for meretricious ideas derived from Europe.

The lecturer exhibited several exquisite specimens of Indian industrial skill, lent for the occasion by the South Kensington Museum, such as Dacca muslin, Kincob work, silver work, wooden carvings, pottery, and jewelry. Cotton cloth imported from Manchester was far inferior to that woven and decorated with patterns by man's hand in India, but was cheaper. Spinning and weaving mills had lately been erected at Bombay, but native artisans were organizing bands of minstrels who went about the bazaars singing songs ridiculing the vulgarity of taste displayed in European textile fabrics. The connection between trades and castes was then explained. Every caste originally had its fixed occupation, and many castes were merely trade-guilds. Some castes, however, had changed their occupations. All the low castes might be tillers of the soil; these constituted three-fourths of the whole population; the higher castes might engage in almost any industry. The Indian village system was the germ out of which the present castes and trades were developed. The various functionaries of an autonomous village community were then described. If any one offended against caste rules, he was "Boycotted." No one would buy from him or sell to him. "Boycotting" was a bad imitation of a custom practiced in India for centuries. Modern castes, trades, and industries, were innumerable. Some new ones reported in the recent census were rather strange—such as "professional speech-makers" and "professional givers of evidence." Indian art and industry ought not to be denationalized; the evil of caste should be neutralized by corrective influences rather than by government interference. Caste had its good side, which should be retained.

The Alphabet in Writing and Printing.

The proportionate use of letters, as given in Brewer's "Dictionary of Phrase and Fable," is as follows:

E,	1,000	H,	540	F,	236	K,	88
T,	770	R,	528	W,	190	J,	55
A,	728	D,	392	Y,	184	Q,	50
I,	704	L,	360	P,	168	X,	46
S,	680	U,	296	G,	168	Z,	22
O,	67[illegible]	C,	280	B,	158		
N,	670	M,	272	V,	120		

Consonants, 5,977; vowels, 3,400.

The proportion for initial letters is as follows:

S,	1,194	M,	439	W	272	Q,	58
C,	937	F,	388	G,	266	K,	47
P,	804	I,	377	U,	228	Y,	23
A,	574	E,	340	O,	206	Z,	18
T,	571	H,	308	V,	172	X,	4
D,	505	L,	298	N,	153		
B,	463	R,	291	J,	69		

Waste Paper.

A recent report of the controller of the British Stationery Office, whose function is to provide the paper used in all the government offices, states that the value of the waste paper collected from the various offices and sold for the public account averages $50,000 a year. Hitherto it has been the rule to turn the bulk of this paper over to a single firm, under bond to reduce it to pulp in the United Kingdom. Under such conditions, the price received was less than the paper was worth in open market. The paper is now sent to the state prisons, where it is sorted and torn up, so as to be rendered practically illegible, and then sold unconditionally at much better prices than before.

At first thought it might seem to be more economical to burn the paper at once, and thus save all the expense of collection and transportation; but the controller states that the money received for waste paper in some years amounts to more than the total salaries of the controller, assistant controller, and staffs of the department in both England and Ireland.

A New Snow Melter.

A Philadelphia engineer, Mr. Leonard Phleger, has had constructed a snow melting machine, described as a wagon with an iron body, surmounted by a smokestack. At the rear of the body, like a fire engine, is a firebox, the heat from which ascends to a space eight inches high, which extends the length and width of the body. Above this space is the snow box, which is two feet deep and fourteen and one-half feet long. The theory of the inventor is that the heat, which passes through the narrow space immediately beneath the box, will keep the floor of the box heated to such a degree that the snow will melt as fast as it can be thrown into it. On one side of the box is a line of holes three inches wide, through which the water from the melted snow will run into the street. The smokestack can be placed in either a horizontal or a perpendicular position. The entire apparatus is sixteen feet long and the body three feet deep. Unfortunately the snow thawed before the machine was ready for trial.

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A NOVEL MOTOR.

The engraving shows a means of imparting motion to vehicles and machinery by the employment of soft tubing beneath a flexible bearing surface for traction wheels. The tubing and flexible bearing, under the influence of steam, water, air, or other expansible or compressible fluid forced into it, will form a wedge-shaped or inclined wall or abutment in the rear of the tangential bearing of the wheel, and propel it with greater or less speed according to the pressure of the propelling medium.

Fig. 1 shows the application of the principle to a rotary steam or air engine. Fig. 2 shows the rotary engine in a horizontal position adapted to running a millstone. Fig. 3 shows the device applied to the propulsion of wagons or cars, and Figs. 4, 5, and 6 show the application of the motor to elevated railroads.

The annular casing of the rotary engine is divided into two compartments, C C, in each of which is placed a very strong flexible hose connected at one end with the branched supply pipe, A, and at the other end with the branched exhaust pipe, B. These pipes, although designated as supply and exhaust, may be employed for either, as the motor is capable of running equally well in either direction. The hose in the compartments, C C, are provided with a flexible metallic bearing plate, which may be of steel or other suitable material, and upon these plates the wheels, D, press so as to bring the interior surfaces of the flexible hose into contact at that point. These wheels are supported by arms connected with the engine shaft, and when steam is admitted by either of the pipes, A B, and allowed to escape by the other, an inclined abutment is formed behind the wheels, which push them forward with greater or less force depending on the pressure of the steam, air, or water used in the motor.

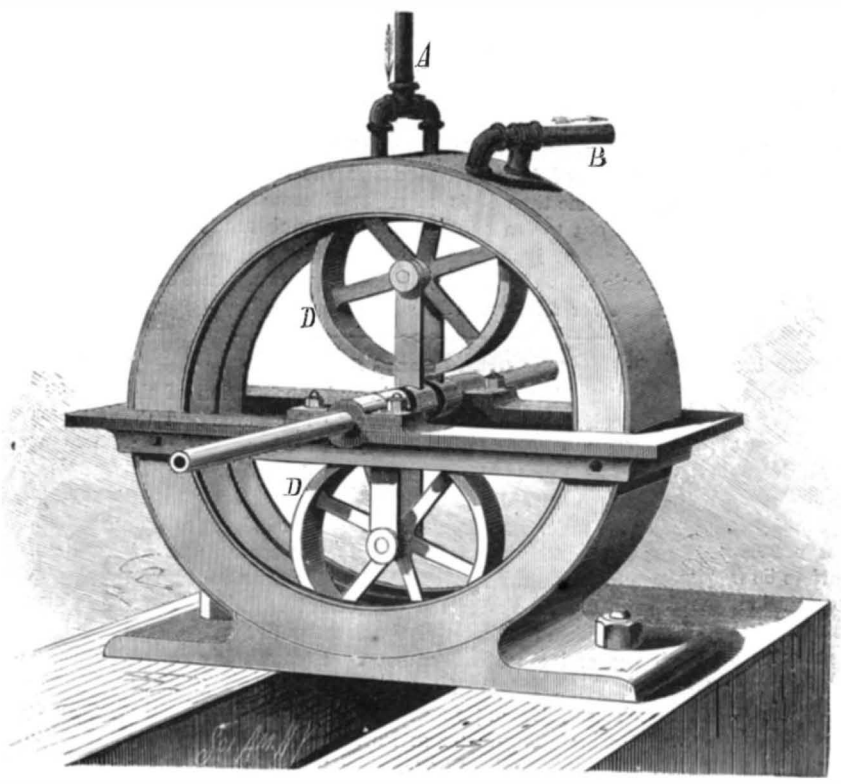
We are informed that these motors are capable of running at a very high velocity, and that they are efficient and may be applied to a large number of uses where the ordinary steam engine would be impracticable. Certainly nothing could be more simple, no piston, no valves, no stuffing-boxes being required. The position in which this motor is placed is immaterial. It is shown in Fig. 2 placed in a horizontal position and adapted to the driving of millstones and vertical shafts. In this view the engine is shown in section, and the relative position of the flexible hose, C, its metallic covering, and the wheels, D, is clearly shown.

When the device is applied to railways the flexible tube or hose, E, is laid in a grooved track, F, and is protected by a straight ribbon of steel, upon which the wheels of the vehicle roll. This arrangement is adapted to light traffic, and for many purposes will answer admirably, but where the traffic is great the car is supported upon wheels running on an ordinary rail, while the driving wheel presses upon the hose with only enough force to bring the hose together, steam, water, or air tight, immediately beneath the driving wheel.

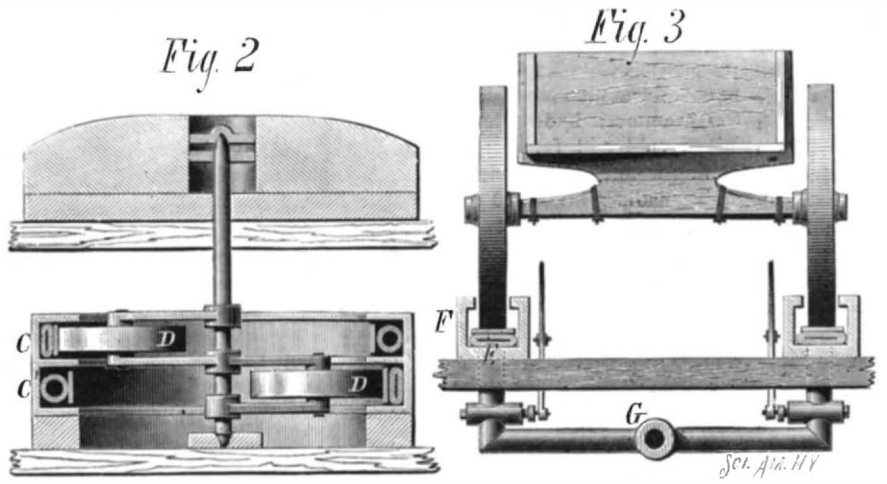
The hose is divided up into sections of fifty feet or more each, and each section is supplied by air from a main supply pipe, G, running below the track and connected with the air compressing station. At suitable intervals lateral pipes lead to valves at the sides of the track, with which the hose is directly connected. At this point there is a valve connected with the lever, H, and at the ends of the car there are levers which may be thrown out to engage the lever, H, and operate the valve so as to admit air to the section of hose upon which the car is just entering. The auxiliary lever at the side of the lever, H, is connected with the lever at the end of the filled section of hose, and as the driving wheel is leaving the filled section the lever carried by the car trips the auxiliary lever, moving the remote lever, H, and almost immediately touching the lever, H, of the section just entered.

It will be seen that by this arrangement collision is avoided, as the car on any particular section of the road has absolute control of that section. This system permits of running cars as frequently as may be desired, avoids all smoke and noise incident to steam propulsion, and is of necessity cheaper, both in respect to the road, propelling power, and rolling stock than any of the existing systems.

This invention was recently patented by Mr. M. M. Conger, of Wellsville, Mo. Further information may be obtained by addressing Messrs. Conger & Bro. as above.



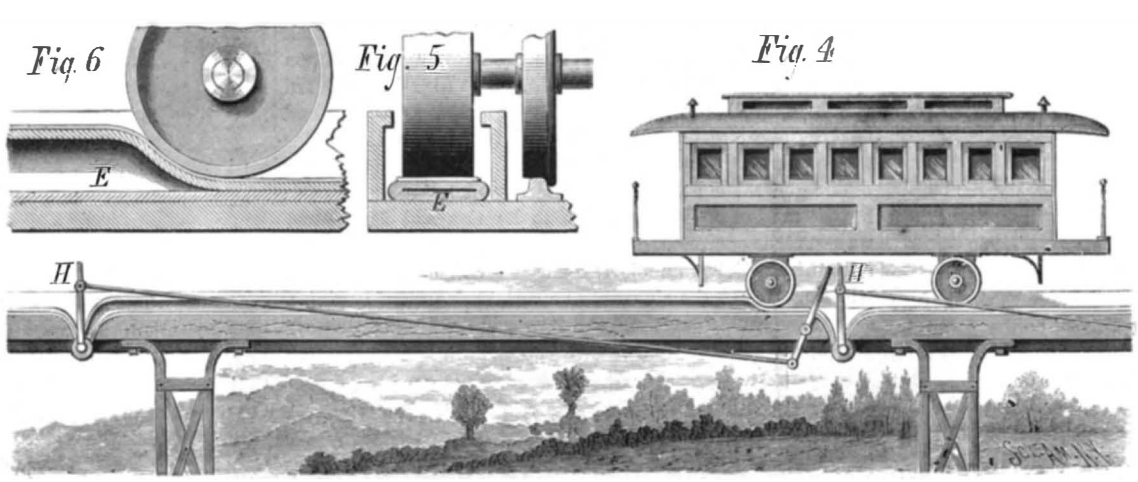
CONGER'S MOTOR.



MOTOR APPLIED TO MILLSTONE. MOTOR APPLIED TO RAILROAD.

The Sunflower.

This plant absorbs, both from the soil and atmosphere, an enormous amount of branched It is from the evaporation of the moisture charged with the gases emanating from the fermentative decomposition of such materials as street sweepings and garbage that diseases due to air charged with such vapor are inhaled and produced. An average sized sunflower plant will give off twenty ounces of water in twenty-four hours, all of which it must derive from the soil and the air. It is nothing strange, therefore, that it has been planted with great success in very many cases to counteract such malarious effects. It also shades the ground, and thus prevents very rapid evaporation of such injurious vapors Apart from this the produce of the crop is very valuable if properly managed. The average yield of seeds is about fifty bushels to the acre, yielding one gallon of oil to the bushel. The oil is good for table use, burning in lamps, and for the manufacture of soaps. The yield of marc or refuse after the oil has been expressed is about 1,500 pounds from an acre, and is an excellent food as oil cake for cattle, or as a manure. The stalks, when burned for alkali, will give 10 per cent of potassa, a very high average; and it has been lately stated that they will give a large amount of fiber useful for textile purposes or for paper making. The seeds are also an excellent food for poultry, who are very fond of them.



CONGER'S MOTOR APPLIED TO ELEVATED RAILROAD.

RECENT INVENTIONS.

Mr. Charles A. Simpson, of Saxonville, Mass., has patented a picture-cord attachment. The cord has a piral spring attached to one end and a flat hook attached to the other end, this spiral being screwed on the picture cord near the lower end, and a hook passed through an eye near the bottom of the rear of the same, and then passed up and hooked on to the cord lower or higher, according to the desired inclination of the frame.

Mr. Jacob C. Landes, of Souderton, Pa , has patented a shutter worker, which consists in a novel combination of a U shaped double cam fixed on the outer end of the crank rod passing through the side of the window frame, with a rod hinged on the outside of the window frame at right angles to the crank rod, and embraced by the cam, and extending horizontally along the face of the blind or shutter, so that the open blind or shutter may be unlocked, closed, and locked, or the closed blind or shutter be unlocked, opened, and locked.

Mr. Charles Chevalier, of Brooklyn, N. Y., has patented an engraving or chasing machine, designed for engraving or chasing on metals, stones, etc. The invention consists of a revolving engraving or chasing tool operated by a cam-actuated trip hammer, and of novel devices for guiding and adjusting the tool.

Mr. Shubael Cottle, of New York city, has patented a die for making bracelets, by the use of which he is able to make band bracelets so much cheaper than has heretofore been done that their cost, in proportion to the metal contained in them, is very much reduced. The bracelets made by this die are strong, durable, and finished in a superior manner.

Mr. Antoine Guipet, of Courbevoie, near Paris, France, has patented a window frame. It is of cast iron, and of such construction as will render it convenient in handling, transportation, etc. The architectural design presents a pleasing appearance. The sill is constructed to prevent water from penetrating from the outside.

Mr. Samuel H. Everett, of Macedon, N.Y., has patented an improvement upon a fertilizer-distributer for which letters patent No. 222,478, dated December 9, 1879, were granted to him. The present improvement enables the mechanism for discharging the fertilizer to operate more perfectly.

Messrs. George H. Hastings and Robert H. Crean, of Toronto, Ontario, Canada, have patented an improvement in the manufacture of hats, caps, and bonnets, which relates more particularly to head gear manufactured from textile materials. The invention consists in cutting the shoddy or other material into strips, which are then sewed together in squares of any desired size. The squares are then stiffened with glue or shellac, or any other suitable material, and pressed out in dies into any shape that may be required. The strips may also be sewed to any desired shape (instead of being sewed in blank) prior to being stiffened to that shape, and afterward pressed either by hand or by machinery. The material may be cut and sewed in parallel lines or diagonally in combination or in any shape that taste may suggest, and it may also be sewed in such a way as to produce the appearance of being corded

The Wyoming Valley Salt Bed.

A correspondent of the *Tribune*, writing from Wyoming, N. Y., gives the following information concerning the rich deposit of salt which has been opened there. About three years ago a company boring for petroleum struck, at the depth of 1,250 feet, a bed of pure rock salt 70 feet in vertical thickness. Its lateral extent is not known; all that has been observed of the deposition of salt, as well as the working of salt mines in Europe, leads to the conclusion that causes which deposited such a depth of salt must have operated over an extensive area. It seems evident that the Wyoming salt mine and the salt springs of Salina, Syracuse, Western Canada, Michigan, Wisconsin, and Iowa belong to the same geological formation, namely, that known as the

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Onondaga Salt Group, which was deposited during the Salina period, in a series of shallow, land-locked seas, extending east and west from Eastern New York to Iowa. Evaporation caused a deposition of salt in the bottom of these seas; occasional incursions of ocean water in tides and waves kept up a supply of brine, and the deposition went on so long as favorable conditions continued. The slight dip of all the rock strata of Western New York, fifteen to thirty feet to the mile, in connection with the gradual rise of the surface of the country in the same direction, explains the greater depth of the salt formation at Wyoming than at Salina, the springs at the latter place being about 200 feet deep.

The well, eight inches in diameter, is cased with an iron tube. Inside of this is a two-inch tube. Pure water from a spring in the near hillside is caused to run into the larger tube. The water, descending to the mine, becomes saturated with salt and is then driven up the smaller tube, from which it is pumped into a huge reservoir and from that drawn into an evaporating pan, thirty by twelve feet, over a furnace, in which seventy-five barrels of salt can be made in a day. The salinometer shows the brine to have a strength of 90, complete saturation being denoted by 100. Analysis shows the salt to contain only 3 parts of impurities in 1,000.

WATERPROOF ARTIFICIAL FLOWERS.—Mrs. Rosa Harden, of Baltimore, Md., has devised a new method of making artificial flowers, by which the natural beauties can be imitated as with wax, while the flowers are durable and washable. The basis of the leaves would appear to be gelatine chemically treated. Very pretty and promising results are said to be possible by the new process.

THE PARASITES OF A MONSTER JELLY FISH.

BY C. F. HOLDER.

The discophore known as the *Cyanea artica* is familiar to every frequenter of the sea shore, where their stranded jelly-like forms can be found after every tide evaporating, as it were, in the summer sun. While afloat and active in the water they afford protection to several parasites that are figured in the accompanying engraving. The large creature hanging from the inner lobe of the jelly fish is a parasitic sea anemone called the *Becidium parasiticum*. In the engraving it is life size, while the *Cyanea* is reduced greatly. The *Actinia* is generally found in the larger specimens concealed in the mouth folds, where it shares the food brought up by the tentacles of its protector. In appearance it resembles an elongated cone strongly ribbed along its sides; around its mouth are a few short tentacles. The body is covered with innumerable wrinkles, with which it attaches itself to its post, and to which it is a strong contrast, being violet or brownish-red in color. Two or three can generally be found on them.

The little worm-like creature shown on the outer edge of the *Cyanea* is a true parasitic worm, the *Monopus medusicola* —with a depressed subcylindrical body armed with two suckers. The fore one, strange to say, is imperfect, while the latter—one-third the total length from the tail—is columnar and truncate. In the engraving it is magnified twelve fold.

Besides these, numerous little fishes are found up under the tentacles, that with their terrible lasso cells would seem the last place for a fish to choose as a home, but here we find them, darting in and out among the treacherous tentacles, perfectly at their ease.

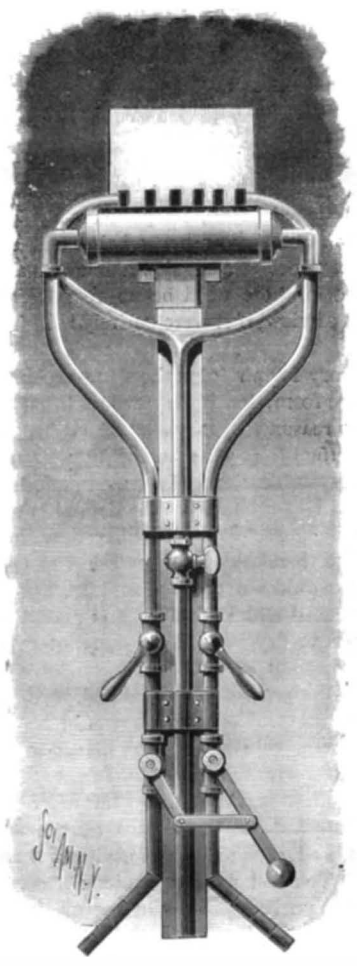
The *Cyanea* is a giant among its fellows and attains a diameter of seven feet, with tentacles two hundred feet long. Mrs Agassiz thus speaks of one: "He was quietly lying near the surface, and did not seem in the least disturbed by the proceeding, but allowed the oar, eight feet in length, to be laid across the disk, which proved to be about seven feet in diameter. Backing the boat slowly along the line of the tentacles, which were floating at their utmost extension behind him, we then measured these in the same manner, and found them to be rather more than fourteen times the length of the oar, thus covering a space of some hundred and twelve feet. This sounds so marvelous that it may be taken as an exaggeration; but though such an estimate could not, of course, be absolutely accurate, yet the facts are rather understated than overstated in the dimensions here given. And, indeed, the observation was more careful and precise than the circumstances would lead one to suppose, for the creature lay as quietly, while his measure was taken, as if he had intended to give every facility for the operation."

The different stages of the young of this animal are so totally different that they have been described as separate animals, namely *Scyphistoma*, *Strobila*, and *Ephyra*. This enormous creature is produced by a hydroid measuring about half an inch in height. The eggs are laid in the autumn, and the young, when first hatched, are oval, soon they become pear-shaped and attach themselves to the bottom. Now minute tentacles (never over sixteen) appear, and the creature resembles a simple polyp. It grows rapidly, constriction taking place along its entire length, each one being lobed around its margin, until it finally looks like a pile of inverted scalloped saucers. The top one dies and falls off, and the others soon separate by the deepening of the constrictions, and swim off, perfect infantile cyaneas, that soon reach a large size, and in turn deposit eggs.

THE PARASITES OF A MONSTER JELLY FISH.

NEW LIME LIGHT.

The lime light illustrated herewith possesses a few novel features of considerable value, not the least among which are that it will take a block of common lime of any shape and of any reasonable size, instead of the expensive cylinder usually employed, and that the light being once regulated, it may be turned up and down from a distance without the necessity of approaching the light for focusing and adjustment.



NOVEL LIME LIGHT.

The particular form of apparatus illustrated is intended chiefly for theaters and other large inclosed areas. The chamber in which the combination of the gases takes place contains a series of perforated metal tubes, one within another, the function of which is to insure the complete admixture of the two gases before they arrive at and issue from the burners, which are fixed upon the upper part of the cylindrical chamber.

This feature of the invention is an important one, as it insures the perfect union of the gas without introducing an element of resistance to its flow as occurs when gauze, coils of wire, shot, and other obstructions are employed with the idea of deflecting the currents and so of securing combination.

For the purpose of regulating the light two levers are provided, one on each side of the apparatus. These levers have engraved upon them the names of the gases (oxygen and hydrogen) which they respectively control by means of stop taps. These taps being once adjusted require no further attention, and the light may be turned up and down and regulated at will by means of the tap shown at the bottom of the apparatus, and which controls the supply of both oxygen and hydrogen. This tap may occupy any convenient position when the light is situated where it is not readily or conveniently accessible.

The pipe shown in the center of the apparatus is connected with the ordinary gas service, and supplies gas for the purpose of warming the block of lime, igniting the mixed gases, and preventing explosions. It is stated that the apparatus is so simple that any one may work it with perfect safety, and that it gives ten to twelve times more light than an ordinary burner using the same amount and quality of gas.

The apparatus is being made and introduced by the inventors, Messrs. Allen & Co., of Cardiff, England.

Chimborazo and Cotopaxi.

A large and distinguished company lately assembled at the Royal Institution, Albemarle street, to hear Mr Edward Whymper describe his ascents of these mountains. His Royal Highness the Prince of Wales, who was attended by Colonel Teesdale, the Marquis of Queensberry, Lord Aberdare, Sir Beaumont and Lady Florence Dixie, Sir Allen Young, Sir T. Fowell Buxton, Mr. W. Spottiswoode, Colonel Grant, and the Dean of St. Paul's, were among the audience that filled the lecture theater. Mr. C. E. Mathews, late president of the Alpine Club, took the chair.

It is, unfortunately, impossible in a necessarily short report to give any idea of the charm of the narrative which Mr Whymper had to relate, brightened as it was by many quietly-given touches of humor. Personal matters, however, were only introduced when they served to illustrate some scientific observation. While purely athletic mountaineers had his sympathy in the practice of mountaineering as a sport, Mr. Whymper confessed that his sympathies were much more with those who employed their brains as well as their muscles. His journey to the Andes was to be one of work, and all its arrangements were devised so as to economize time to the uttermost. In observations for altitudes and position, in studying the manners and customs of the country, in photography and sketching, in the collection of objects of interest, from beetles on the summits of went tains to antiquities buried in the ground, he found quite sufficient to occupy his time. From Bodegas the party was composed of two Swiss mountaineers, the cousins Carrel, of Val Tournanche, Mr. Perring, some muleteers, and their teams. About two tons weight of the most portable and most condensed provisions went out for their use, and irrespective of the things which were bought already tinned, more than 2,000 tins were soldered down. When they reached the summit of Chimborazo, on the 3d of January, after a most arduous climb, they found the wind blowing at the rate of 50 miles an hour from the northeast, and driving the snow before it. With extreme difficulty a reading of the mercurial barometer was effected. The mercury fell to 14·1 inches with a temperature of 21° Fah. This being worked out, in comparison with a nearly simultaneous observation at Guayaquil, gave 20,545 feet for the height of Chimborazo. They began the descent at 20 minutes past 5, with scarcely an hour and a quarter of daylight, and reached their camp (about 17,400 feet above the sea level) about 9 P. M., having been out nearly 16 hours, and on foot the whole time.

Passing from an extinct to an active volcano, Mr. Whymper next gave an account of his journey to the crater of Cotopaxi. Observing with the telescope, during an enforced stay at Machachi, that much less smoke or vapor was given off at night than by day, he resolved, if possible, to pass a night on the summit. On the 18th of February the party got to the edge of the crater, having passed almost the whole way from their camp, at a height of 15,000 feet, to the foot of the final cone over snow, and then over ash mixed with ice. The final cone was the steepest part of the ascent, and on their side presented an angle of 36°. When they reached the crater vast quantities of smoke and vapor were boiling up, and they could only see portions of the opposite side at intervals, and the bottom not at all. Their tent was pitched 250 feet from the edge of the crater, and during a violent squall the India-rubber floor of the tent was found to be on the point of melting, a *maximum* thermometer showing a temperature of 110° on one side of the tent and of but 50° on the other; in the middle it was 72·5°. Outside it was intensely cold, and a thermometer on the tent cord showed a *minimum* of 13°. At night they had a fine view of the crater, which has a diameter from north to south of

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2,000 feet, and from east to west of about 1,500 feet. In the interior the walls descend to the bottom in a series of steps of precipice and slope a good thousand feet, and at the bottom there was a nearly circular spot of glowing fire, 200 feet in diameter. On the sides of the interior higher up, fissures, from which flickering flames were leaping, showed that the lava was red-hot a very short distance below the surface. The height he found to be 19,600 feet. The party remained at the top for twenty-six consecutive hours, sleeping about 130 feet below the loftiest point. At first they had felt the effects of the low pressure of the atmosphere, and again, as at Chimborazo, took chlorate of potash with good effect. All signs of mountain sickness had passed away before they commenced the descent, and did not recur during the journey. Nearly five months later Mr. Whymper returned to Chimborazo, and from a second reading of the barometer at 14·028 inches, with a temperature of 15° Fah., he made the height 20,489 feet, the mean of the two readings giving 20,517 feet. While on the side of Chimborazo he witnessed a magnificent eruption of Cotopaxi, ash rising in a column 20,000 feet above the rim of the crater and then spreading over an area of many miles. Professor Bonney had submitted the ash to microscopic examination, and found that the fineness varied from 4,000 to 25,000 particles to the grain in weight, and from observation of the area over which the ash fell Mr. Whymper calculated that at least two million tons must have been ejected in this one eruption.

The Prince of Wales, in proposing a vote of thanks to Mr. Whymper, said the matter which he had laid before them that evening was such as must be of deep interest even to those who had not had any experience of the ascent of high mountains. After remarking upon the pleasing and entertaining manner in which the subject had been treated, his Royal Highness, for his own part, thanked the members of the Alpine Club for the treat they had given him by inviting him to hear the lecture.

Preparation of the Salts of Uranium and Vanadium at Joachimsthal, Bohemia.

BY C. LALLEMAND.

The uranium ore is pitch-blende of the sp. gr. 7. It contains on an average 40 to 55 per cent of urano-uranic oxide (U_3O_4), besides vanadium, arsenic, sulphur, molybdenum, tungsten, cobalt, nickel, copper, bismuth, lead, silver, iron, manganese, lime, magnesia, alumina, and silica. The analysis of the sample is thus performed: a portion of 3 grms. is heated on the sand bath with moderately concentrated nitric acid. At the end of two hours the reaction is complete; the solution is decanted, and the residue filtered and washed with hot water till the washings no longer give the characteristic red color with potassium ferrocyanide. The collected liquid is then mixed with sodium carbonate in excess, and boiled to expel free carbonic acid. The totality of the vanadium, iron, lime, lead, copper, etc., is thus precipitated, while uranium remains in solution. The sediment is allowed to settle for some hours, after which it is decanted, washed with hot water by decantation, filtered, and washed upon the filter with hot water until the washings, after slight acidulation with hydrochloric acid, no longer give a red coloration with potassium ferrocyanide. The excess of sodium carbonate is then decomposed by the addition of hydrochloric acid, the free carbonic acid being expelled by boiling, and caustic soda is then added, which throws down all the uranium as sodium uranate with excess of alkali. The mixture is decanted, filtered, and washed very slightly on account of the ready solubility of sodium uranate in pure water; it is dried, the filter detached and burnt, its ash added to the precipitate, and the whole ignited at dull redness in a platinum crucible. When cold it is washed in cold water to remove excess of soda, filtered, dried, ignited, and weighed. We have thus a certain weight p of sodium uranate, $NaO, 2N_2O_3$. The corresponding weight of U_3O_4 is found by calculation. The practical treatment of the ore comprises five operations: Roasting the ore with sodium nitrate and carbonate, lixiviation of the roasted mass, treatment of the residues with sulphuric acid, precipitation of the foreign metals with sodium carbonate, and purification of the liquid and precipitation of the uranium. This precipitation is effected differently according as it is desired to obtain the product in a light yellow or the orange state. For the former the liquid is precipitated with caustic soda, until a portion of the liquid on acidulation no longer gives the red reaction with potassium ferrocyanide. To obtain the orange-colored variety the carbonate of soda is very gradually neutralized with sulphuric acid, avoiding excess. The precipitation is complete. Six different preparations of uranium are produced—uranate of soda, of a light yellow, an orange, and a bright orange; uranate of potash, of a bright orange; uranate of ammonia, of a light yellow; and black uranium oxide. The vanadium present in the Joachimsthal ore does not exceed 0·1 per cent, and the methods tried for its extraction do not appear to have been commercially successful.

Sulphate of Iron.

The salt, protosulphate of iron—or, as the more recent terminology has it, ferrous sulphate—is a purer form of the copperas or green vitriol which can be purchased at the dry-salter's at about a penny per pound, and it is a chemical possessing many very interesting properties apart from its photographic qualities. It is singular—but not less singular than true—that, common and varied as are its uses in pure chemistry, as also in that special branch of applied chemistry which most interests our readers, there are, even yet, many points about its properties which remain uncertain and matter for discussion among chemists. Sufficient, however, is known to show its usefulness and importance, the many changes it undergoes, and the varieties in its forms that may be met with.

It usually occurs in commerce in the form of nice, dry, compact crystals, not very large in size and of a bluish-green color, in which shape it is fairly permanent, though exposure to air, if the crystals be at all damp, is apt to lead to their decomposing with the formation of the brown basic salt, much to the detriment of the appearance of the crystals. Some time ago there was to be found in commerce a sulphate of iron crystal quite different from that we describe, and which was practically free from tendency to decompose. The crystals were very even in size, but of a color quite different from the usual or more familiar kind, being, in comparison, a green of a decidedly yellow—not brown—cast. We have not seen it lately, and cannot say if it be now produced at all, its permanency being its chief passport to use; but, that property being gained at the expense of the presence of a considerable amount of free acid with the crystals, there need be no regret, from a photographic point of view, if it were entirely banished from commerce.

It is customary for photographers to purchase these crystals in the pure form; but if they choose to take a little trouble there is no reason why they should not become their own chemical manufacturers—the purification, as usual, consisting only in recrystallization. If a dozen pounds of clean and fresh copperas be purchased at the dry-salter's, dissolved in about four gallons of hot water, filtered, a little sulphuric acid added, and then the whole set aside to crystallize in a place where it would not cool too rapidly, a crop of crystals would be produced which, drained and placed on pieces of blotting paper to dry, would be equal, for photographic purposes, to the best to be bought, and at a considerably reduced cost—the process of crystallization, too, being very interesting to watch. The crystals would be still better if pieces of string or thin sticks were placed in the liquid for the crystals to form upon. For further economy, the mother liquid—that is, the solution left after crystallization—might be boiled down in an iron saucepan till crystals begin to form, and then again put aside for a fresh crop to be produced. The last mother liquid will contain most, if not all, of the impurities present in the original crystals of copperas.

The solubility of sulphate of iron is represented in a singularly variable light, some authors giving tables remarkably different from others. Perhaps the following, which is on the authority of Herren Brander and Firnhaber, may be considered as nearly correct as possible:

Temperature in Degrees Centigrade.	Quantity of Water required to Dissolve One Part
10	1·64
14	1·43
25	0·87
32·5	0·66
46	0·44
60	0·38
84	0·37
90	0·27
100	0·30

It will thus be observed that a singular property is shown to be possessed by this salt, its solubility increasing till it reaches within some little distance—10° Centigrade—of the boiling point, when it quickly begins to get less soluble, so that a solution saturated by treatment at 90° over an excess of crystals will be found to have a crust upon its surface when raised to boiling point.

This solution of ferrous sulphate gradually becomes brown colored by keeping, and quickly so if exposed to the air. It, however, strange to say, does not pass beyond a certain stage of change. When that point has been reached no further alteration in its appearance and qualities takes place, and the solution may be kept for a long time—if evaporation be provided against—without subsequent change. The deposit which has been formed is variously stated to be of a basic character, with greater or less proportions of acid.

We have called the commercial crystals "dry;" but, strictly speaking, they will be found to have a slight amount of water clinging to them; and to this is owing the gradual oxidation and browning that occurs when they are kept for any length of time. If the crystals are well dried by pressure between cloths and placed in a dry bottle they will keep for a long time unaltered.

It may be obtained in the form of a slightly blue tinted powder by adding a strong solution to a small quantity of alcohol; the salt, being insoluble in that liquid, is thrown down as a powder, which may be preserved well without oxidizing if kept in a dry place. Another method of obtaining it in powder is to spread a number of crystals out before a fire with occasional turning, when they will part with most of their contained water—seven molecules of water usually crystallizing with it—and effloresce till white through the whole crystal. At this stage it may be easily powdered, and should then be put in a stoppered bottle, in which manner it may be kept almost indefinitely. This powder will, we need scarcely say, be stronger than an equal weight of the crystals, three grains being equal to five.

We may close our remarks by noting that a solution of sulphate of iron that has been kept till well oxidized forms a good antidote against cyanide of potassium, if swallowed directly afterwards.—*British Journal of Photography.*

Action of Certain Chlorides on Aniline Colors.

BY GIRARD AND J. A. PABST.

The authors introduced into tubes the chlorides of silicon, $SiCl_4$, of carbon, CCl_4, and of tin, $SnCl_4$, with four times their respective volumes of chemically pure aniline, which, with arsenic acid, yielded not more than one five-hundredth of its weight of mauvaniline without a trace of red or yellow. The tubes were sealed and heated for twelve hours to 225° to 230°. No pressure was observed when they were opened. The carbon perchloride had produced triphenylguanidine, rosaniline, and a brown matter, offering all the reactions of Bismarck brown, which is well known to be produced by the action of aniline hydrochlorate upon rosaniline. Tin perchloride yield violaniline and mauvaniline in small quantity, a large proportion of rosaniline or pararosaniline; also Bismarck brown, and a trace of green matter. Silicon chloride yielded violaniline, and especially triphenylene diamine blue, as well as a trace of mauvaniline. Antimony perchloride, heated with aniline to 125°, reacted very violently, forming violaniline, a small quantity of triphenylene diamine blue, and a certain quantity of a blue matter, analogous to that produced by the action of hydrochloric acid upon the azoic compounds. Thus, notwithstanding the parallelism of their properties and constitutions, carbon chloride yields rosaniline; silicon chloride, violaniline; and tin chloride, both these coloring matters.

Industrial Society of Mulhouse.

At a special meeting of the society, a letter was read from M. Caro, contending that Messrs. Lloyd & Dale, and not Mr. Thomas Brooks, invented the process for fixing aniline colors by the joint action of tannin and tartar emetic. A silver medal was offered for a decided yellow color equal in permanence to alizarine, and fixed in the same manner. A note from M. Brandt was read on the preparation of stannic sulphocyanide by the double decomposition of calcium sulphocyanide and stannic oxalate. It is likely to find extensive applications in calico printing. M. Dollfus read some extracts from a report on cadmium yellow. M. Jacquet has observed that a few grms. of a salt of cadmium added to a chromate of lead color considerably retard the sulphuration of the latter during steaming. MM. Noelting and De Salis communicated investigations on the nitrized cresylols. On treating the diazoic derivative of ortho-toluidine with nitric acid they obtained a binitro-cresylol fusible at 86°, and yielding crystalline yellow salts. It appears to be identical with a compound discovered by M. Piccard in a commercial product known as saffron substitute.

A Novel Actinic Phenomenon.

BY DR. PHIPSON.

The author describes a zinc-white of a dazzling purity obtained by precipitating a solution of zinc sulphate by means of barium sulphide, submitting the precipitate to strong pressure, and igniting it with limited access of air. If any barium sulphide escapes oxidation, the white compound, on exposure to the sun, begins to darken, and in about twenty minutes becomes of a deep slate color. If removed into a dark place it gradually loses color, and in about five or six hours it becomes again snow-white. This experiment may be repeated with the same specimen as often as desired. Further, this change of color does not take place under a slip of common glass, whether thick or thin; at most the compound takes a slight yellowish-brown color on exposure to the sun for two hours. The sample on analysis was not found to contain silver or any other substance known as actinic.

Manufacture of Soda from Sulphate.

Salt cake is produced in quantity in California in the manufacture of nitric acid. As coal and limestone are dear in California, Le Blanc's process is not economical. The author therefore proposes to mix a solution of salt cake with calcium sulphite and pass in sulphurous acid. Soluble calcium bisulphite is formed, and by decomposition calcium sulphate and sodium bisulphite. The two salts are separated by filtration, and the sodium bisulphite is treated with milk of lime. The result is a solution of caustic soda, retaining a certain quantity of sodium sulphite and sulphate, which is evaporated down in the usual manner, and calcium sulphite, which is used again in the process.—*J. Putzkow, in Dingler's Pol. Journ.*

Hardening Steel.

According to a Sheffield paper a very fine preparation for making steel very hard is composed of wheat flour, salt, and water, using, say, two teaspoonfuls of water, one-half a teaspoonful of flour, and one of salt. Heat the steel to be hardened enough to coat it with the paste by immersing it in the composition, after which heat it to a cherry red and plunge it into soft water. If properly done, the steel will come out with a beautiful white surface. It is said that Stubs' files are hardened in this manner.

A COSTLY LETTER ENVELOPE.—Among the curious articles in the Indian Court of the Melbourne Exhibiton are two hollow elephant tusks, fitted with a gold cover. They were sent to the Viceroy of India by the Rajah of Burmah, who used them as an envelope for an official communication. They are valued at $1,000.

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Four Years of Industrial Progress.

The following interesting statistics are taken from a Treasury Department statement of the financial and economic transactions of the United States during the past four years:

	For year ended March 1, 1878.	For year ended March 1, 1879.	For year ended March 1, 1880.	For year ended March 1, 1881.	Total.
Exports of live stock	$4,205,893 00	10,853,241 00	$12 065,459 00	$20,681,738 00	$47,806,331 00
Exports of other food	269.752,809 00	326,752,030 00	374 568,342 00	456,244.111 00	1,427,317.292 00
Total exports merchandise	639.485,209 00	725,856,296 00	767,875,740 00	915,271.563 00	3,048,488,808 00
Specie	47.103,365 00	26.391,143 00	23,722,972 00	16,028,803 00	113,446.283 00
Total imports merchandise	475,838,318 00	432,094,129 00	555,569,696 00	703,139,889 00	2,166,642,032 00
Specie	25,209,050 00	26,999,280 00	92,714,238 00	98,570,197 00	243,492,765 00
Production of cotton, number of bales	4,485,423	4,811,265	5,073,531	5,761,252	20,131,471
Production of wool, number of pounds	207.000,000	211,000,000	232.500,000	264,000,000	914.500,000
Production of wheat, number of bushels	364,194.146	420,123,400	448.756,630	480.849,723	1.713,922.890
Production of corn, number of bushels	1,342 558,000	1,388.218,750	1,547,901,790	1,537,535,900	5,816.214.440
Production of pig iron, number of tons	2,066,594	2,301,215	2,741,853	3.300,000	10,409.662
Production of coal, number of tons	54,308,250	52,130,554	65,808,398	69,200,934	241,448,166

NEW INVENTIONS.

Mr. J. F. Smiths, of Zionsville, Pa., has patented a fly net for horses, so constructed that the lash cannot slip into the ribs, but will be firmly knotted thereto in a simple and effective manner. The lash of the nettings is attached by passing it through the ribs from the outer to the inner side, then passing it over the lower edge, outer side and upper edge of the rib, and then through the same from the inner to the outer side.

Messrs. John Dimelow and Robert M. Peadro, of Round Rock, Texas, have patented an improvement in the manufacture of hydraulic cement and lime from rotten or decomposed limestone. They first burn the decomposed stone, then subject it to currents of air or steam in a tightly closed receptacle, and finally sift the material either with or without grinding, by which a strong cement is obtained.

Mr. Elisha S. Griffith, of Ghent, Ky., has patented an insect-killer which consists of a bar or rod having a bowl at each end and pivoted in the middle, so that the heavier bowl descends. The device is placed in a tobacco or other field at night, both bowls filled with fuel, and fuel in one of the bowls is ignited. As the fuel burns the bowl containing it rises, and finally assumes a position above the other bowl, whereupon its embers will drop upon and ignite the fuel in the lower bowl. The insects are attracted to the flames and are destroyed.

Mr. Charles Hill, of Sodus Point, N. Y., has patented an apparatus for drying fruit by means of artificial heat. An asbestos lined case is provided with a novel elevating arrangement for carrying trays for holding the articles to be dried. The trays have net-work bottoms, and the circulation of heated dry air through the case (which latter, by virtue of its asbestos lining, retains the heat) is relied upon for desiccating the fruit.

Mr. Silas M. Bragg, of Hickman, Ky., has patented an adjustable sawing and routing machine for the more rapid manufacture of bed-rails, friezes, etc. The table of the machine has a circular saw and router at each end, with a movable carriage, whereby the piece is presented in such manner as to be operated upon at both ends simultaneously. The table may be shortened or lengthened to operate on different lengths.

Mr. Thomas T. Lotherington, of Houston, Texas, has patented a stencil-brush by which the waste of ink accompanying the use of ordinary stencil brushes is avoided; and whereby the time commonly lost in dipping the brush is also saved. A reservoir for ink is formed in the handle of the brush, and a valve feeds the ink to the bristles at such times and in such quantity as may be desired by the operator.

Mr. William B. Atkinson, of Franklin, Ky., has patented a fish trap of the kind composed of two hollow skeleton or wire jaws hinged together and closed by cords for trapping fish. He has provided improved means for suspending and opening the trap, and holding the jaws at such an angle as will facilitate their closing.

Mr. Edward P. Haff, of Brooklyn, N. Y., has patented a device for putting up cord balls, such as balls of twine, knitting cotton, etc., which protects the balls from soiling when exposed for sale or in use, and controls the unwinding in such manner as to prevent tangling. For this purpose a protective case guard or wrapping constructed of paper or other analogous cheap material is employed.

Mr. Benjamin Slusser, of Sidney, Ohio, has patented an improvement in excavators, which is an improvement upon a self-loading ditching machine or excavator for which letters patent No. 72,098, dated December 10, 1867, were granted to him. The present improvement secures a more perfect co-operation of the apron with the plow, and greater convenience in discharging the contents of the machine when loaded.

Mr. Orlando E. Lewis, of Urbana, Ohio, has patented an improvement in boots and shoes, by which leather is economized, durability is increased, and comfort to the wearer is secured. The front portion of the upper is turned outward at the lower edge and stitched to the sole. The front or wearing part of the sole is made of two pieces of leather of equal dimensions and similar shape, extending backward to form the shank, which latter is stiffened in the usual way.

Mr. George F. Newell, of Greenfield, Mass., has patented an improved feeding mechanism for sewing machines, which relates to that class of feeds in which a longitudinally-reciprocating rod or bar is arranged at right angles to the feed bar and imparts motion to the latter through a bell crank lever. The invention consists in a novel construction and arrangement of mechanism for raising and lowering the feed-bar, pushing it forward and backward, giving it an interval of rest, and for shortening and lengthening the stitch.

Mr. Walden Pickett, of Andover, Ohio, has patented an improved fruit crate, more particularly intended for holding boxes or baskets of small fruit, but which may also be used for peaches and other fruits The crate is made in two sections and provided with a lid or cover. Each section accommodates a prescribed number of boxes, and is provided with removable bars having rabbeted ends, which permit their easy insertion between the slats of the sides of the sections. When baskets are packed the bars are removed; but when boxes are packed, which require less space than baskets, the bars are placed between the side slats to fill the space. The sections have also slatted bottoms, and are provided with false bottoms with slats made to fit between the slats of the principal bottom, which are used when large fruits are packed.

Mr. David Williams, of Eagleport, Ohio, has patented an improved kettle holder for supporting kettles and other kitchen utensils of different sizes over a fire. It consists of a legged ring and one or more inwardly beveled rings provided with downwardly and vertically projecting pins, the latter rings fitted to rest in and upon the legged ring, the pins serving also to keep the smaller rings in place.

Mr. Thomas F. Darcy, of New York city, has patented a reversible center-plate for furniture, such as the seats and backs of chairs, sofas, and the tops of tables, which permits of one side being upholstered in one style while the opposite side may be upholstered in another style. Devices for holding the plate firmly when reversed are supplied.

Mr. John D. Parker, of Kansas City, Mo., has patented a composing-stick gauge for printers' use, by which instead of setting the composing stick by leads (which often vary in length from imperfect cutting, thus giving trouble in locking forms), it is accurately set. The gauge consists in a metallic plate divided into rectangular sections of different lengths in "em" measurement.

Value of Sawdust.

We should hardly credit so large a story from a less reliable source than the *N. W. Lumberman*, but we presume the editor has the statistics at hand to confirm his assertions:

"In New York there are about 500 venders of sawdust, having a capital of $200,000 invested, and doing a business amounting to more than $2,000,000 annually. Forty years ago the mills were glad to have sawdust carted away; twenty-five years ago it could be bought for 50 cents a load, but the price has increased, and now it brings $3.50 a load at the mills. It is used at the hotels, eating houses, groceries, and other business places. It is wet and spread over floors in order to make the sweeping cleaner work. Plumbers use a great deal about pipes and buildings to deaden walls and floors. Soda-water men and packers of glass and small articles of every kind use it, and dolls and some living creatures are more or less stuffed with it. Yellow pine makes the best sawdust, as it is the least dusty, and has a pungent, healthy smell. But any white wood dust will do. Black walnut sawdust will not sell and is burned."

How to Grind a Glass Plate.

It is sometimes useful to know how to impart a finely-ground surface to glass suitable, say, for a focusing screen. Mr. C. S. de Joux good-naturedly sends us, all the way from Mauritius, a simple method he has practiced, which certainly deserves to be recorded. Finely-ground sand or river mud—or, what is better still, the sediment from a grindstone—is well stirred up in a bowl of water, and after a few minutes the upper half of the liquid decanted off. The decanted liquid contains all the finer particles, and these, after subsiding, are collected in a watch glass. The sheet of glass is laid on a damp cloth spread upon a table, and the watch glass and mud used as a muller, the convex side of the watch glass supplying a good hold for the fingers. In a quarter of an hour a satin-like polish will be obtained, admirably adapted for focusing. A rinse with water will show if the grinding has been uniform.—*Photo. News.*

Cheap Paint.

Three hundred parts washed and sieved white sand, forty parts of precipitated chalk, fifty parts of rosin, and four parts of linseed oil are mixed and boiled in an iron kettle, and then one part of oxide of copper and one part of sulphuric acid are added. This mass is applied with an ordinary paint brush while warm. If it is too thick, it is diluted with linseed oil. This paint dries very rapidly and gets very hard, but protects woodwork excellently.—*Corps. Gras. Ind.*, 7, 13, 151.

Malaria in Italy.

The question whether it is possible to saturate the human system with some substance which, without prejudice to general health, would counteract the germs of malarial infection and enable persons to live in malarial districts with impunity at any time, is being studied by M. Tommasi-Crudeli. In the end of the seventeenth century arsenious acid (commonly called arsenic) was largely employed in the treatment especially of the graver forms of the disease, and though displaced to some extent since the discovery of quinine, is still used as being cheaper and sometimes efficacious where quinine is not. In some cases, too, the system will not bear the dose of quinine necessary. Now, M. Tommasi-Crudeli knows of cases where men had to pass the summer in the most unhealthy districts of the Agro Romano, and who were every year attacked by the fever till the last two years, when by a regular use of Fowler's arsenical liquor they have both enjoyed immunity and regained appetite and vigor. He is about to make experiments on animals to find (1) whether such immunity may be secured in a constant way; (2) what is the *minimum* daily dose of arsenious acid (in proportion to the body weight) which will make the system refractory to the malarial ferment. An extensive distribution of such a poisonous substance among an agricultural population would, no doubt, be attended with danger; and M. Tommasi-Crudeli suggests the use of the arsenic in some such way as that lately adopted at Caserta in the treatment of a grave malarial epidemic. The substance was supplied in the form of gelatine tablets (made by Decian, of Venice), each divided into 50 square pieces, easily detached, and each piece containing so much arsenic (2 mgr.). For the preventive purpose the proportion would be reduced.

The nature of malarial fever has been further elucidated by the researches of MM Cuboni and Marchiafava. In the former researches by MM. Tommasi-Crudeli and Krebs (1879) it was a curious fact that the characteristic form of the *bacillus* was not found in the circulation of persons who had the fever, though largely in certain parts, the spleen and bone-marrow especially. It now appears that during the ingress of the fever, and also during the last period of the febrile intermittence, the blood of the whole body contains a considerable number of individuals of the parasitic species. These are mostly spore-producing; and when, in the second period (up to the crisis) they are all, or nearly all, destroyed, one sees in the blood merely a number, sometimes enormous, of the small spores which have been liberated, and which in favorable conditions produce a new generation of *bacilli* in the same blood.

Think while you Read.

The *Teacher's Journal*, in an article on methods of study, reminds the student that the first essential to successful study is the power of concentration of thought. This power is largely a matter of habit and cultivation. Read five pages of history in a lackadaisical manner. Close the book and write out all you can remember. Then compare your production with the printed matter, and you will be able to judge of your proficiency. Read five pages more with fixed attention and a resolution to retain the subject, and compare as before. You will find a marked improvement. If your memory is treacherous read but very little, and always write out the subject. When you hear a sermon or address, *hear* it, and afterward reduce it to writing. Read no novels, and do not read aloud to please others unless you care (nothing) for the article yourself. A practiced reader can read aloud for hours and carry on an independent train of thought all the time. This ruins the faculty of study as well as the memory. Dismiss all other subjects but the one in hand. Let the ear be deaf to all sounds, and the eye blind to all sights. Let the sense of touch sleep, and smell and taste be as though they were not. A lesson learned in this state of mind will stay with you, and will not need to be "crammed" again the night before examination. It will be like lines carved deep into the rock, or chiseled on the Rosetta stone. The other method is the dim tracing of obscure letters in the sand, which the next wave obliterates.

MEDICAL GYMNASIUM.—A medical gymnasium was lately opened in Paris. It has been built in the Chausee d'Antin, at an expense of £20,000, by a public company. About seventy mechanical contrivances of different descriptions have been arranged in a series of rooms. The greater number of these are worked by a steam engine, and all of them can be graduated by screws, so that the extent, duration, and velocity of motion can be regulated according to the direction of the physicians.

Photographing Music.

An English paper tells of a gentleman, who, on being asked to sing, produced from his pocket a little case which contained his music, photographed down to the size of note paper. He had duplicate copies of each song, and handed one to the accompanist, singing from the other himself. The expedient saved all the bother of bringing a roll of music, unfolding it, collecting it again, and so forth.

DRYING POTATOES.—Benjamin Wing, of Rochester, has been largely engaged in the business of supplying the Northwestern army, and his practice is to first slice the potatoes, then put them in a steam box three or four minutes to keep the starch in. and then subject them to drying. If not placed in the steam box, the starch would come out. When used, they are soaked, and are then like fresh potatoes.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Cope & Maxwell M'f'g Co.'s Pump adv., page 188.

The American Electric Co., Proprts Mfrs of Thompson Houston System of Electric Lighting the Arc Type. See adv., page 189.

Foot Power Printing Press; Chase, 8 x 10; Price, $65. I. W. Colburn, Fitchburg, Mass.

The New System of Bee Keeping. Every one who has a farm or garden can now keep bees with pleasure and profit. For particulars address Mrs. Lizzie E. Cotton, West Gorham, Maine.

N. C. Baughman's Climax Wash. Mach. See adv., p. 188.

For the Cheapest Process of Manufacturing Bricks, see Chambers Bros. & Co.'s adv., page 190.

Rowland's Vertical Engine. Wearing parts of steel. Broad bearings. F.C.& A.E.Rowland, New Haven, Conn.

50 cents each will be paid for the following numbers of London *Engineering*. Jan. 14, 28, and Feb. 18, 1876; Sept. 14, 1877. B. R. Western, No. 8 Broad St., N. Y.

Boomer & Boschert's Cider Press will perform better work and produce more cider from the same quantity of apples than any other press in the world. Farmers and others interested, send for illustrated circulars to the New York Office, 15 Park Row.

Any one having a first-class new Sewing Machine, well protected by patents, can find a responsible party to make on royalty or purchase patents, by addressing "Advertiser," Box 773, New York.

See Special Bolt Forging Machine Notice, page 204.

Blake's Belt Studs are better than lacing or any other fastening for belts. Greene, Tweed & Co., New York.

The New York Assay Laboratory.—Short, practical courses of instruction in Iron Chemistry and Assaying of Ores. Send for circular. Thos. B. Stillman & Co., 40 Broadway, N. Y.

Gear Wheels for Models (list free); Models, Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Philadelphia, Pa.

R. J. W.—Froth or scum in your boilers caused by sediment in water from driven wells, entirely obviated without loss of water, by Hotchkiss' Mechanical Boiler Cleaner. Send for circular. 84 John St., New York.

Telephone and Call Bell, complete set, only $3. Model Novelty Co., Boonton, N. J.

For Machinists' Tools, see Whitcomb's adv., p. 173.

For Light Machinists' Tools, etc., see Reed's adv., p. 156.

Large Slotter, 72" x 18" stroke. Photo on application. Machinery Exchange, 261 N. 3d St., Phila.

Buy the Buffalo Port. Forge. Have no other.

Presses, Dies, and Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, successor to Bliss & Williams, Brooklyn, N. Y.

L. Martin & Co., manufacturers of Lampblack and Pulp Mortar-black, 226 Walnut St., Philadelphia, Pa.

Send to John D. Leveridge, 3 Cortlandt St., New York, for illustrated catalogue, mailed free, of all kinds of Scroll Saws and Supplies, Electric Lighters, Tyson's Steam Engines, Telephones, Novelties, etc.

Pure Oak Lea Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

Star Glue and Pure Turkey Emery for Polishers. Greene, Tweed & Co., 118 Chambers St., New York.

Within the last ten years greater improvements have been made in mowing machines than any other agricultural implement. It is universally acknowledged that the Eureka Mower Co., of Towanda, Pa., are making the best mower now in use, and every farmer should write to the manufacturers for catalogue, with prices.

Jenkins' Patent Valves and Packing "The Standard." Jenkins Bros., Proprietors, 11 Dey St., New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

The "1880" Lace Cutter by mail for 50 cts.; discount to the trade. Sterling Elliott, 262 Dover St., Boston, Mass.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited. Erie, Pa.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co. 52 Dey St., N.Y.

National Steel Tube Cleaner for boiler tubes. adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Wren's Patent Grate Bar. See adv. page 173.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Eclipse Portable Engine. See illustrated adv., p. 158

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

4 to 40 H P. Steam Engines. See adv. p. 158.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 158.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Saunders' Pipe Cutting Threading Mach. See p. 173.

Nickel Plating.—Sole manufacturers cast nickel anodes pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Saw Mill Machinery. Stearns Mfg. Co. See p. 141.

Clark Rubber Wheels adv., See page 172.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 172.

See Bentel, Margedant & Co.'s adv., page 188.

For Sale.—Two New 66-inch Stevenson Turbine Wheels composition buckets: 200 H. P.; price, $1,500. Continental Works, Greenpoint, Brooklyn, N. Y.

Diamond Saws. J. Dickinson, 64 Nassau St., N. Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Peerless Colors—For coloring mortar. French, Richards & Co., 410 Callowhill St., Philadelphia, Pa.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 188.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 188.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

For the manufacture of metallic shells, cups, ferrules, blanks, and any and all kinds of small press and stamped work in copper, brass, zinc, iron, or tin, address C. J. Godfrey & Son, Union City, Conn. The manufacture of small wares, notions, and novelties in the above line, a specialty. See advertisement on page 188.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 188.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p. 189.

Best Band Saw Blades. See last week's adv., p. 189.

Reed's Sectional Covering for steam surfaces; any one can apply it; can be removed and replaced without injury. J. A. Locke, & Son, 40 Cortlandt St., N. Y.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 189.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

Penfield (Pulley) Blocks, Lockport, N. Y. See ad. p. 189.

Tyson Vase Engine, small motor, 1-33 H. P.; efficient and non-explosive; price $50. See illus. adv., page 188.

Use Vacuum Oil Co.'s Lubricating Oil, Rochester, N. Y.

For Thrashing Machines, Engines, and Horse Powers, see illus. adv. of G. Westinghouse & Co., page 189.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) E. S. M. writes: I am about to build a steam velocipede of three wheels of about 4 feet in diameter. Would we have more power to have the piston rod connected right to the back axle? A. No. 2. Would it be best to have one or two cylinders, and what size to carry three persons? A. Two, about 2½ inches diameter by 4 inch stroke. 3. The size of boiler, and of what material? To be plain or tubular? A. Tubular. Size depends on speed and weight of vehicle. 4. Can that be heated by lamps, or would it be best of coal or wood? A. Coal or mineral oil or coke.

(2) J. H. P. writes: 1. I want a cheap cement for uniting half-inch lead pipe that will last six months and stand a water pressure of six feet? A. Join the pipe with a piece of stout canvas or duck smeared with red lead in oil, wrapped several times about the joint and bound with copper wire. 2. What is the purport of the term "limited" as applied to a firm or company? A. The term limited signifies a limitation of the individual responsibility of members of a firm or company.

(3) F. & S. ask: What is dynamite, and how is it made? A. The name was originally applied by Nobel to a preparation of infusorial silica partially saturated with nitroglycerine. Other earths and gunpowder mixed with nitroglycerine are now frequently classed under the same name. Consult Mowbray's "Trinitroglycerin."

(4) J. H. N. writes: We have exhausted part of the steam from our engine into the cistern that catches the rain water. Examination shows that the cement has all scaled off and the cistern is worthless. I am told that this result always follows such treatment, also that no cement exists that will make the cistern tight if steam is admitted. Would like to learn through the columns of the SCIENTIFIC AMERICAN, if with such management a cement is known that will cause the cistern to hold water, or is our only course to line it up with wood or iron? A. Few cements applied will retain their integrity under such conditions for any length of time owing to the excessive alterations of temperature and the action of the steam and heated water. Better board up the cistern, or better line it with iron.

(5) E. M. T. writes: 1. I want thorough light on the subject of "luminous paint." A. Experiments in the manufacture of luminous paint have not proved successful in this country so far. We believe the imported article is now for sale by some of our dealers in colors. See our advertising columns. 2. I want to bleach thin sheets of wood quickly and cheaply. A Scour lightly with hot solution of caustic soda, rinse, submit to a strong bath of chloride of lime (calcium hypochlorite) in cold water, then to a dilute solution of oxalic acid. Repeat the two last if necessary, rinse, and dry.

(6) J. M. writes: In answer to inquirer, 21, in your paper of March 5, I would say that refined benzine will dissolve the disagreeable odorous oily substance which is secreted from some people's skin. After which plenty of soap and water will remove it. This persevered in will make the skin inodorous.

(7) P. Y. asks: What ingredients are required to make mirror glass and how to prepare them? A. The proportions are as follows: Finest white quartz sand, 720 parts; best soda, 450; lime, 80; niter, 25; cullet (broken plate glass), 425. Powder, mix, and heat in the crucible for 48 hours.

(8) J. H. W. asks: What is the best preparation used to produce a polish on bone and horn and give a glossy appearance, and how applied? A. First use finely ground pumice stone and water, applied with a felt polishing wheel; finish with rotten stone applied in the same way.

(9) L. A. asks for a receipt for stove polish paste as known under various names in trade: Russian, Acme, American, stove paste polish. A. Reduce graphite (blacklead) to an impalpable powder by grinding in a mill with a little water, and dry. In using moisten with water first, and finish with the dry powder.

(10) E. G. A. asks: Is there any chemical process or other mode of extracting the dextrine or sap from green lumber? A. Boil in a solution of 1 lb. caustic soda to the gallon of water.

(11) J. H. K. writes: Myself with some others have need to use some blue colored fire for out-of-door use, but cannot obtain a good blue color; it has a whitish shade. Could you give me a receipt for making a good color? A. Blue fires: 1. Sulphur, sulphate of potassa, and ammonio-sulphate of copper, each 15 parts; niter, 27; chlorate of potassa, 28. 2. Niter, 5; sulphur, 2; metallic antimony, 1. 3. Fine gunpowder, 4 parts; sulphur and metallic zinc, each 3 parts; niter, 2 parts. 4. Nitrate of baryta, 77 parts; sulphur, 13; chlorate of potassa, 5; charcoal, 3; realgar (sulphide of arsenic) 2 parts. 5. Chlorate of potassa, 69 parts; sulphur, 24; sulphate of copper, 7. 6. Black sulphide of antimony, 4 parts; niter, 12; sulphur, 16; charcoal and orpiment (sulphide of arsenic) ¼ part. The purity of the color of these fires depends very much upon the care bestowed in drying and powdering each ingredient and in mixing the prepared substances.

(12) M. M. asks: What is the action of arsenic in the human system? What are the symptoms of arsenical poisoning, and how large a quantity is required to produce fatal results? A. "Arsenic is a non-accumulative irritant poison, and exerts no decided chemical or corrosive action on the tissues." (Taylor.) Its action is to inordinately increase the secretions and diminish the contractility of the voluntary muscles. The symptoms vary according to the form and dose in which the poison has been administered. The average time at which they appear is generally from half an hour to an hour after the poison has been taken. It produces at first a nameless feeling of illness, failure of strength, and aversion to eat or drink, followed by nausea and intense burning pain in the region of the stomach increased by pressure. These symptoms are soon followed by retching, vomiting, sense of constriction in the throat with intense thirst; diarrhea, more or less violent, accompanied by severe cramps in the calves of the legs; matter discharged from the stomach dark greenish or yellow, sometimes streaked with blood. There is tenesmus and sometimes excoriation of the anus; pulse small, very frequent, and irregular; skin cold and clammy in the stage of collapse, at other times very hot; respiration painful; eyes red and very bright; sometimes coma supervenes, with paralysis and tetanic convulsions, precursors of death. 2½ grains have caused death.

(13) D. F. C. asks: Can I melt zinc clippings in an iron ladle over a coal fire? I want to cast zinc plate for a battery. What kind of mould should be used? A. You can readily melt zinc clippings in the way you propose. A sand mould will answer, but a metal mould would be better.

(14) C. D. M. asks: 1. Please describe a practical mode of electro-engraving. A. Clean the polished plate thoroughly, warm it slightly, and give it in the dark a flowing coat of the following solution; Fine gelatine, 5; isinglass, 5; bichromate of ammonia, 1½, water, 200; mix, and dissolve by aid of heat over a water bath. When dry, cover with a glass photographic positive (strong), of the reduced design (in limework), and expose to sunlight for about 20 minutes. Remove to a dark room, take off the glass, and put the plate in water, first warm, then hot, change the water several times; then connect the plate by means of copper wire with the carbon pole of a moderately strong bichromate battery, the other pole of which is joined to a large copper plate. Immerse both plates in sulphuric acid diluted with three volumes of water until the prepared plate is properly engraved. Clean in a hot caustic potash dip. 2. Why will not a silver coin do for the anode in a silver-plating solution? A. Because it is not pure silver. 3. Please give a good method of gold plating. A. See article on electro-metallurgy, gold deposits, page 116, current volume. 4. In plating gold on silver is it necessary to first wash the silver with any solution to make the gold adhere firmly? A. No. 5. To obtain a brilliant polish is it necessary to use greater intensity in silver plating? A. See article on electro-metallurgy, silver deposits, page 81, current volume. 6. In the electric light should Grenet or Fuller batteries be coupled for intensity or quantity? A. Intensity.

(15) C. P. K. writes: 1. I have a yacht, hull 58 feet long, 13 feet beam, and 7 feet depth of hold, moulded. Will two 36-inch wheels (propellers) run it 22 miles an hour, and what size engines necessary to do so? A. No. We doubt if any power you could put in, would drive it 22 miles per hour. 2. I have a double cylinder engine, bore 8 inches and stroke 8 inches, running at 300 revolutions per minute. Is the engine too large? Wish to make the boat as fast as possible, without regard as to cost of running it. A. A pair of 8 inch by 8 inch engines would be too small for high speed, but a very fair speed could be obtained (with good model) by carrying 140 or 150 lb. steam, and running 300 revolutions per minute. 3. Is there an electric machine described in SCIENTIFIC that will run 15 of Edison's electric burners, and if so, in what number? A. Edison's generator, described on pp. 239 and 243, vol. xli., SCIENTIFIC AMERICAN, would answer your purpose. No detailed description of his later machine has been published. 4. Would an engine, 3 inch stroke and 3 inch bore, run the machine described in SUPPLEMENT, No. 161, if it were enlarged four times, and, if not, what sized engine would it take, to attach it direct? Or in other words how much must the machine be enlarged to run 15 of the above named lamps, and what sized engine? A. This machine is not adapted to the Edison light. An engine of the size given would run a machine of this kind three or four times as large as the one described in the SUPPLEMENT.

(16) C. H. asks: 1. How can I make a gallon of nickel plating solution? How is copper and brass prepared or cleaned before plating? How is iron prepared before plating so as to make the nickel plating adhere? A. See article on nickel plating, page 153, vol. xliii., SCIENTIFIC AMERICAN. 2. How is nickel "stripped" from articles that are to be replated? A. Use nitric acid diluted with half its volume of water. 3. What is a simple test to find out whether an article is silver or nickel plated? A. Nickel and silver can easily be distinguished by their appearance. 4. Will coin nickel answer the purpose of making solutions and anode? A. No. 5. What kind of battery is the best suited for plating small objects such as binding screws, medals, and thimbles? A. One of the modifications of Bunsen's battery. 6. In making the mercurial air pump described in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 224, vol. ix., will it affect the working of the pump if the glass tubes are made a few inches longer or shorter? A. Yes, the lengths given are correct.

(17) R. J. W. asks (1) how gold leaf on frames is burnished. A. The burnishers used by the frame gilder are either of flint or agate, generally the former. They are made of various sizes and shapes to suit the work. These are passed lightly over the gilded and dry work until properly burnished. It is then usually given a thin coat of very weak clear size. Frame gilding requires much practical experience to do properly. 2. What kind of varnish is put on silver leaf to make it appear like gold? A. Dissolve, by digestion, fine pale shellac in alcohol, and color with turmeric and dragon's blood.

(18) C. P. F. writes: The rise in coal in the river towns from $4.50 to $9 a ton, has made it a matter of general interest as to the respective value of coal and wood for steaming purposes. The books give from 1 to 1¼ cord as the equal of 2,000 lb. coal, but the engine users say it takes 1½ to 1¾ cords wood to produce the effect of a ton (2,000 lb.) of coal. A. Experiment has shown that in practice 1¾ cords pine wood equals 1 ton of coal (2,240 lb.), but this can only be considered approximate, as very much depends upon the character and condition of the wood.

(19) G. H. S. asks how to produce prismatic colors on brass buttons like sample sent. A. The button is brass; it has been thinly coated with a dilute hard gum lacquer to which has been added a sufficient quantity of fuchsine, and when half dry momentarily dipped in alcohol, quickly dried, and thinly washed with uncolored lacquer.

(20) C. B. T. asks: 1. What is the horse power of an engine with a 1½ inch bore and 2½ inch stroke, making 200 revolutions per minute? A. See rule for calculating the horse power of engines in SUPPLEMENT, No. 253. 2. What size fly wheel would you put on an engine of the above dimensions and what weight? A. About 12 or 14 inches diameter and 50 or 60 lb. weight.

(21) D. M. writes: In a brook over which I pass I notice that where there is a strong current the ice forms on the bottom. The depth of water is from four to six inches. Can you explain this? A. The ice you allude to is what is termed anchor ice. The stream being shallow, the water is the same temperature the entire depth, and while the surface current prevents freezing at the top, the more quiet waters below freeze and the ice attaches to rocks and stones, thus preventing it from rising to the surface.

(22) H. C. P. asks: Will water run down hill through a one and a quarter inch pipe, the angle to be 45° to 20°, for half a mile, provided of course the supply to be plenty? A. Yes.

(23) A. J. A. asks: 1. What is sailing distance made by the Cunarders between Boston and Europe? A. Boston to Queenstown, 2,668 nautical miles. 2. And also between New York and Europe? A. New York to Queenstown, 2,798 nautical miles; Queenstown to Liverpool 248 nautical miles. 3. What is the quickest recorded time? A. Arizona, 7 days 8 hours and 8 minutes, July, 1879. 4. What is the sailing distance between San Francisco and Sandwich Islands? A. San Francisco to Sandwich Islands, 2,080 nautical miles.

(24) C. K. S. writes: 1. I am making a fifteen dollar canoe according to the directions given in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 39. Will you please answer the following questions: I have heard it said that the heaviest cotton drilling, well oiled, would answer exceedingly well for the sides of a canoe. Is it so? A. Yes. 2. If I use cotton drilling or canvas which way must I put the canvas: in one piece, that is, so the length of the piece of canvas goes the way of the length of the boat, that is from stem to steru, or in breadth across the boat? A. Lengthwise. 3. Could not a paddle be used instead of sculls, and if so, how long would a double paddle have to be? A. Yes; it must be of such length as you can conveniently handle, if you wish to use it standing; it must be longer than if used sitting.

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(25) G. H. M. asks: 1. How long should work be left in the plating bath to give as thick and durable a nickel plating, using say three cells Daniell's battery? I have used the information from your article on nickel plating, but have no idea how long the articles should remain in the plating bath. A. Expose from one to three hours according to requirements. 2. Should the articles be removed from the bath and scratch brushed or scoured, or simply allowed to remain undisturbed? A In most cases it is not necessary to remove them. 3. Can an article once nickel plated and still covered all over with nickel be replated without stripping or removing the old plating? These questions I can find no satisfactory answer to in any work at my command, and living away from a large city can consult with no nickel plater. A. Yes, if the coating is perfect. In most cases it is better to strip. 4. Can a substantial silver coating be applied to an article with a bath and battery, but without using a silver anode, and if so, how can it be done? I am only an amateur, and these questions will solve some difficulties if you will answer them. A. Yes. Use carbon or platinum anode The bath cannot be depended upon, however, as the silver salts soon become exhausted.

(26) R. S. writes: I would like to know how to make a strong mucilage, that I can put on the back of paper, and use it after it is dry, by moistening it as you would a postage stamp. A. Try the following: Cooper's liquid glue, gum arabic, and white sugar, equal parts, hot water, q. s.

(27) W. S. writes: I have the charge of a 35 horse power engine, stationary, making 165 revolutions per minute, slide valves. There is a dispute among some of us in regard to setting the valves to realize the most power. A. Without knowing the dimensions and proportions of the engine, we could not advise you fully; but at the speed you run the engine, the valve should have considerable lead.

(28) E. S. C. asks: 1. What is the best size of wire for line for acoustic telephones? A. No. 30. 2. Should the wire be hard or soft? A. Soft. 3. Will any other wire beside copper answer for line? A. Soft brass wire will answer. Soft iron wire serves a good purpose, but is not durable. 4. What kind of type is used by bookbinders for printing gold letters on cloth or leather. Will common printing type do? Brass usually. Common printing type may be used, but great care will be required to avoid melting while heating them. 5. What is the powder composed of which they dust on the leather previous to applying the gold leaf? A. Well beaten white of an egg diluted with water is used for this purpose. 6. How can I transfer newspaper cuts to wood to be engraved? A. Take a saturated alcoholic solution of potash, pour it on the engraving, and immediately remove all superfluous liquid by means of blotting paper. Lay the engraving while damp upon the wood and place it in a press (a copper-plate press is best). The transfer will be obtained immediately. The engraving must be immersed in clear cold water after the transfer is made.

(29) W. W. asks: 1. Is the conuvosite metal made up from the sulphurets of several metals, and described as recently invented, inoxidizable, black, hard as wrought iron, melts at 300° Fah., expands in casting, cost $50 per ton—is it sold in this country? A. You probably refer to Spence metal. It is described in SUPPLEMENT, 222. For further information in regard to it address dealers in metals who advertise in our columns. 2. Somewhere in your columns you state that a French authority asserts a quart of nitroglycerine to be equal to 5,000 horse power working continuously. Is this not a misprint or too high an estimate? But, assuming it to be correct, I read often in the SCIENTIFIC paper, and reports of the Aeronautical Society, etc., that if the power were controllable, it would solve the flying question. Suppose one lb. Mowbray's glycerine were mixed with several lb. of raw unconverted glycerine, would not its violence be reduced, like the case of the Otto "silent" gas engine, in which the gas is diluted, etc.? A. We know of no successful experiments in this line. When largely diluted, as you suggest, the detonation of the explosive becomes very difficult and uncertain The extraordinary energy developed in the explosion of nitroglycerine is largely due to the almost instantaneous nature of the reaction in which it consists; and while by the dilution of the liquid by a comparatively inert substance, it may in some degree be possible to bring the power as measured by the volume of gaseous matter produced in the reaction within control, it would seem to be impossible to retard the rapidity of the reaction. Considering the power developed by the increase of volume from the liquid to the heat expanded gas, only the estimate referred to is doubtless excessive.

(30) S. F. asks: 1. What is the best material for small embossed ornamental blocks? A. Papier mache answers very well. 2. What are the proportions of the mixture of bullock's blood and sawdust—is it subjected to pressure, and subsequently dried, to get best results? A. Use enough of the blood to completely moisten the dust. It is submitted to hydraulic pressure, then gradually heated to about 300° Fah.

(31) W. T. asks (1) how cores for brass castings are made. A. The cores are made of sharp sand to which a very small proportion of flour has been added. The sand and flour are mixed dry; the mixture is then moistened with a little stale beer or molasses and water. 2. What preparation they use for pasting parts of cores together. A. Flour paste. 3. Why will the mould not fill up with metal; providing it has lots of air holes? A. Your sand may be rammed too tight, or your metal may not be hot enough.

(32) I. S. R. writes: I have often wondered how common playing marbles were made, but never thought the matter of sufficient importance to warrant much effort to find out; but as my little boy, aged 13, now asks me the question, I refer the matter to you. A. Playing marbles are made from a hard stone found near Cobourg in Saxony. The stone is first broken with a hammer into cubical fragments, and about 100 to 150 of them are ground at once. The mill is something like a flour mill; the lower stone is stationary and filled with concentric grooves, which receive the stone fragments. The upper stone is revolved by suitable power, and small streams of water are thrown on the lower stone. The pressure of the running stone on the small fragments causes them to roll in all directions until they are reduced to perfect spherical form. It is said that it requires only a quarter of an hour to shape the millful.

(33) J. W. S. asks if there is any preparation made for cleaning brass while hot, such as the throttle box, etc., on locomotives, whereby it can be thoroughly cleaned and at the same time retain its luster. I am a locomotive fireman, and like to keep a clean engine, but as she is always hot, I have failed so far to find anything to answer the purpose. A. Where it is not liable to get into wearing surfaces washed emery moistened with kerosene oil is very good. Where the surfaces are subject to wear tripoli or rotten stone and kerosene oil may be used. The oil should be thoroughly removed by means of a cloth and a little dry whiting.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

F. McC.—1. Limestone—the pearly mineral is diallage. 2. Traprock and serpentine. 3. Chlorite. 4. Quartz rock. 5. Fluorspar.

COMMUNICATIONS RECEIVED.

Is Steam Explosive? By S. G.

Determination of the Moon's and Sun's Horizontal Parallax at Mean Distance. By F. G.

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[OFFICIAL.]

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A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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Vessels, armored, N. B. Clark, Philadelphia, Pa.

PATENTS.

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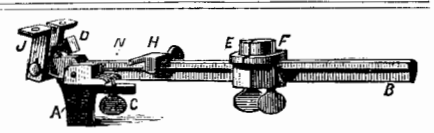

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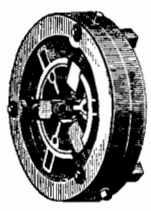

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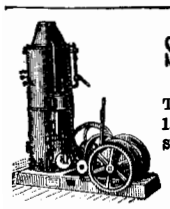

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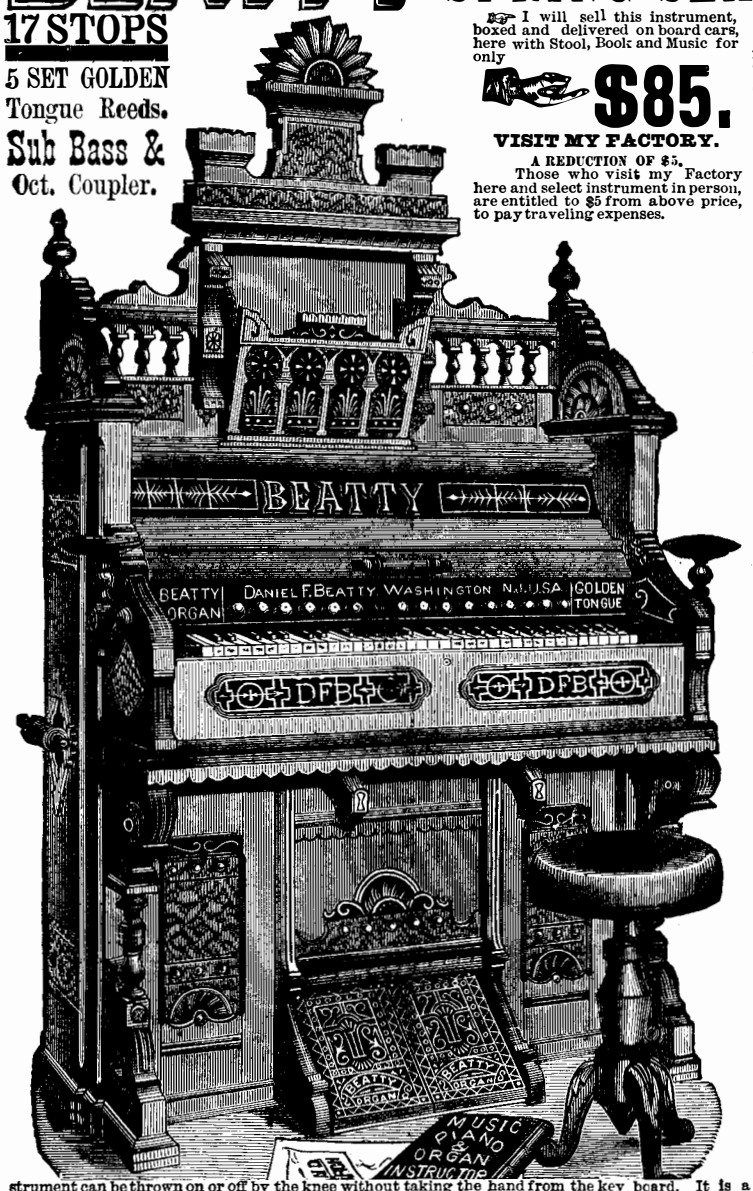

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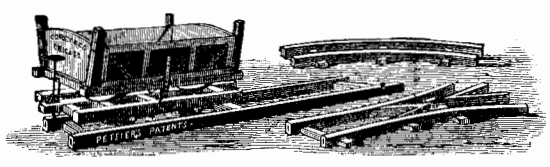

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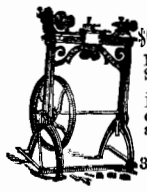

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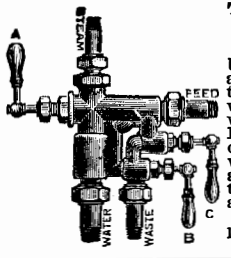

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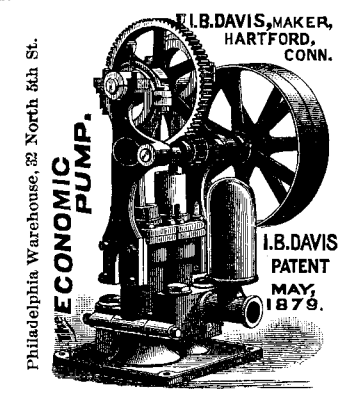
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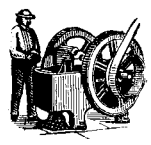

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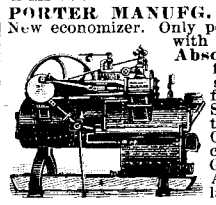

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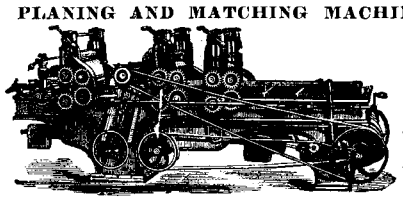

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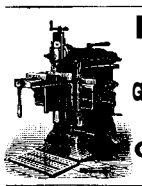

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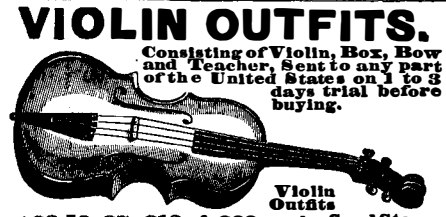

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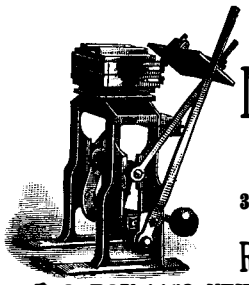

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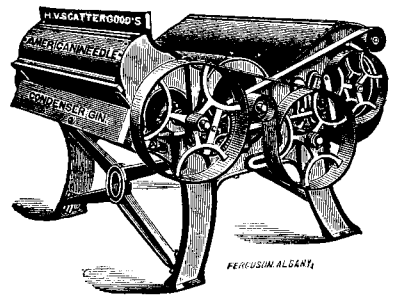

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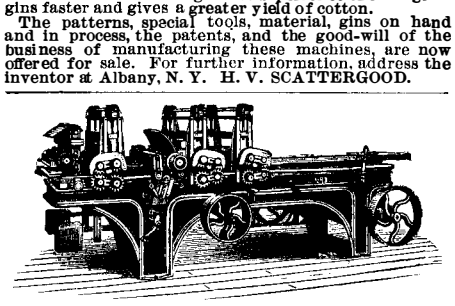

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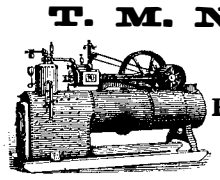

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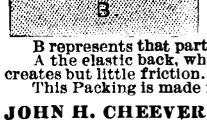

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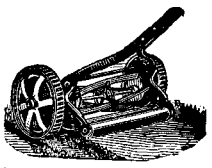

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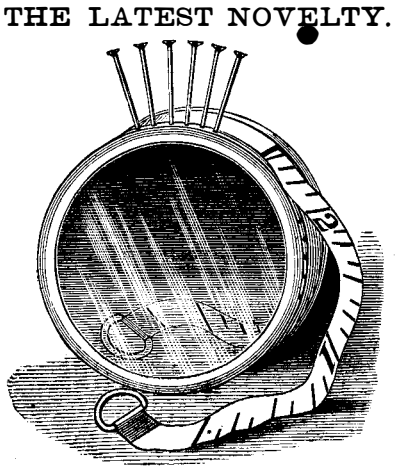

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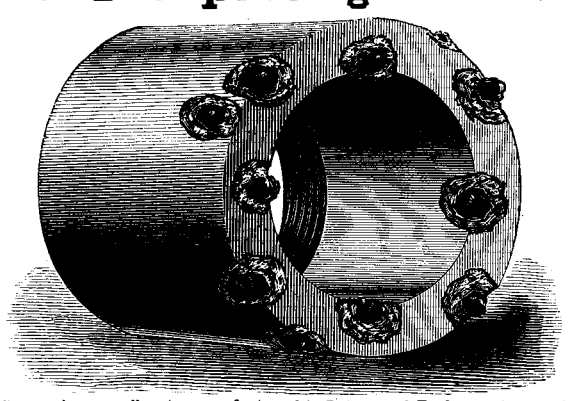

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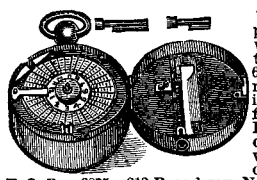

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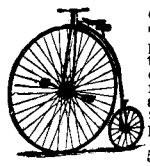

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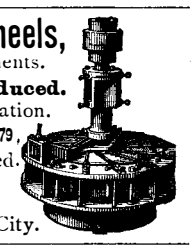

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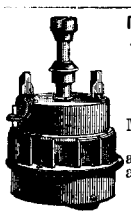

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